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Electrical World

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For Emergencies

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...the Youngstown Supply
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Buffalo, N. Y., was entrusted with a large
portion of the construction work, the first
contract, calling for 50 triple expansion
marine engines of 1,400 horsepower, being
closed Aug. 8, 1917, and followed by
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trouble reported, and the company still is
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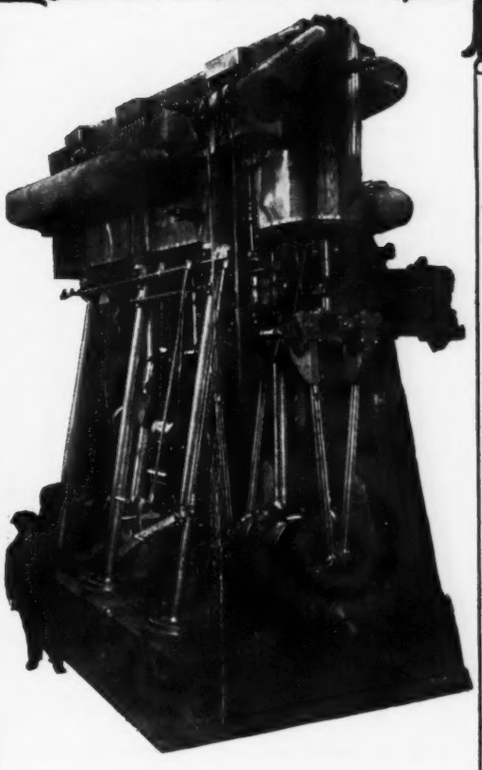

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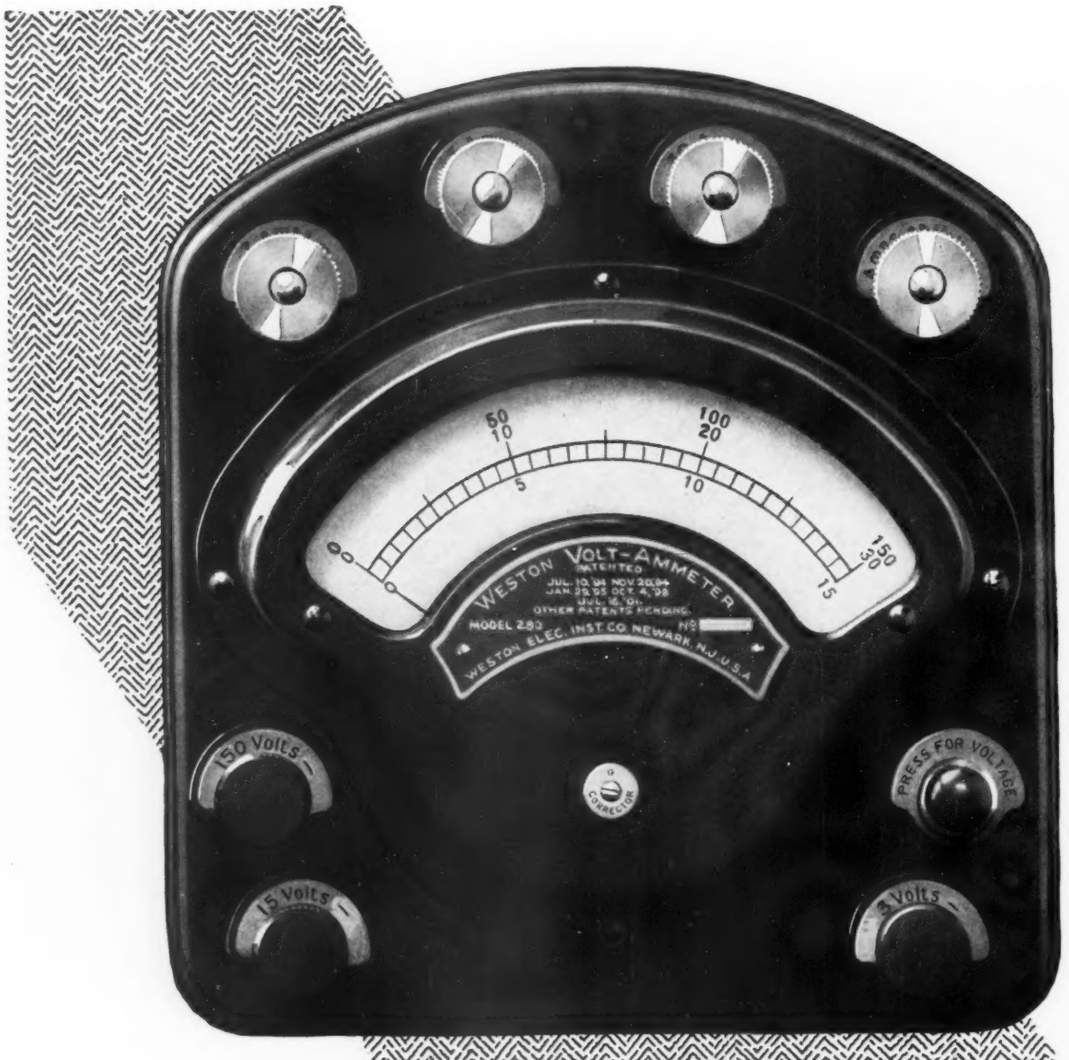

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

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A Memorial of the N. E. L. A. in the War

A MEMORIAL of some character by which the National Electric Light Association may pay its tribute of honor and regard to those in the industry who served the nation in the war is appropriate. The ELECTRICAL WORLD ventures to suggest that such a memorial be arranged in connection with the annual convention or in such other way as may seem more desirable to those directly concerned. What is done in the N. E. L. A. could be arranged also with the same appropriateness by and for other branches of the industry. Men—and also women—and companies and associations in the industry have contributed to the cause. Their efforts and ability have been given freely. Priceless lives have been sacrificed. Lives have been offered willingly at the risk of sacrifice, bodies have been crippled, personal service has been offered, money has been given and loaned, the output of great plants has been turned to strengthen the war machine. In many forms of direct and indirect service the people and the resources of the industry have been devoted patriotically to the national purpose.

For instance, there have been the long rolls of enlisted men from the industry who took their posts of duty and hazard in various departments of the army and navy. There were the dollar-a-year men and those who gave time, thought and money without even that recognition. Conversion of plants to military purposes, stimulation of output that the fighting forces might have what they required, these present another form of service to the country in which the industry justified its existence. There was the association service exemplified for the central-station industry by the National Committee on Gas and Electric Service. Without the products of electrical manufacturers, without the service of jobbers, without the unparalleled production of power by central stations the nation could never have effected the efficient mobilization of all resources which was finally attained. Are not these of the stuff which the industry should put into a permanent record to be part of its history for reference in the years to come?

One of the simplest forms that a memorial could take is a meeting. The N. E. L. A. annual convention program could be arranged to contain a memorial session. The program might be long or short as the judgment of the executives of the association should dictate. To make a concrete suggestion, several addresses would cover the main points. A tribute to the individuals who were with the colors or in other national work, an account of the central-station part, showing the rigid application of energy to the national requirements, reports from the coöperating committees, would tell the large facts in the story. Supplemented by statistical records of the association, this would be a chapter in the history of the industry which would never be forgotten. The *Proceedings* of the association would contain a report of the memorial concluding the work, and it would not be inconsistent to have a tablet commemorating the service put permanently in the New York headquarters.

The natural spirit of such a memorial as we have in mind is the spirit embraced in the resolution passed at the convention in Atlantic City in June, 1918. Recalling the vigor and the patriotic determination there expressed, we can now remember with pride that it pledged "all that we have and all that we are to the holy cause."

Personal efficiency in many organizations fell off grievously under the stress and temptation of war conditions, but the day of individual stocktaking is at hand. Industrial slackerism is scheduled for the discard, and there never was a time when self-scrunity paid better interest on the expenditure of time and hard thinking involved.

Hydroelectric Energy in Canada

A STATISTICAL analysis of the central stations of Canada recently made by Dominion governmental authorities reveals many interesting facts. One of the most important features disclosed is the outstanding position which water power holds in the electric utility field in Canada. The combined rating of the generating equipment in the 470 generating stations of Canada was in 1917 1,844,571 hp. Of this, 1,652,661 hp., or practically 90 per cent, was water-driven, indicating to what a remarkable extent the Dominion has taken advantage of its natural resources. Of special interest also are the figures relating to the capital invested in hydroelectric central stations. While the average capital cost per installed horsepower of all hydroelectric stations in the Dominion is $188, the actual cost of construction, omitting real estate, transmission and distribution equipment, of seventy representative hydro stations, with an aggregate installation of 745,797 hp., is on the average $69.11 per installed turbine horsepower. Thus not only do the central stations of Canada employ water power to a greater extent than central stations in the United States, but the cost of the development is also on the average remarkably low. While this may be attributed in part to excellent local conditions as regards dam sites and power houses, it indicates the application of

engineering skill in a remarkable degree. The Dominion is doubly fortunate in possessing abundant water powers and engineers who know how to develop them economically.

"More and better work" will be the slogan of the individual producer who realizes that American wage and living standards are worth the effort necessary to maintain them in competition with cheap labor and lower-grade habits of life elsewhere.

Accidents and Industrial Lighting

WE HAVE repeatedly called attention to the close inverse relation which exists between proper lighting and accidents to workmen. It takes much hammering at evils to make one small reform. We are therefore duly thankful to Professor Clewell for dragging this matter fairly into the limelight in his paper in our current issue, and we hope that the figures therein cited will make some little impression in industrial circles. When we realize that the yearly accident list in our American industries is five or six times the entire casualty list in the American army during the war it is obvious that the situation must be taken very seriously. If one stops to consider that the graves of those who die in industrial accidents in one year would, placed side by side, reach more than twenty miles across country, one realizes that the matter is not a small one to be lightly dismissed by casual reference to the "risks of the calling" and the "carelessness of fellow workmen."

A few months ago a notable paper was read before the Illuminating Engineering Society by R. E. Simpson dealing with the relation of bad lighting to accidents, and to this paper Professor Clewell very properly devotes especial attention. The grim summation of the accident roll means that, to say nothing of death and injuries, there is lost through accidents labor amounting to more than half a million man-years. This is not an imperceptible or negligible fraction of the total labor output of the country; it is a serious business quite outside of its humanitarian aspect. In addition, Mr. Simpson judges that nearly 30 per cent of these accidents were due last year, directly or indirectly, to poor lighting; that is, by curtailment, negligence and false economy at least 100,000 man-years were lost to the country's industries, and this serious loss is quite outside the loss of output which the recent Chicago experiments indicate as a necessary result of poor lighting.

Looking into the subject somewhat in detail, Professor Clewell is inclined to the opinion that, although lighting curtailment when unwisely carried out has been mischievous, a still more serious source of trouble has been the hurried adoption of powerful lights improperly shaded or installed so that they dazzle the workman and throw dangerously sharp shadows upon work and machinery. We are at a period in the development of the incandescent lamp where we are going through just about the same experience that was had ten years ago when the change from the carbon to the metallic-filament lamp was in progress. At that time an indefinite amount of extremely bad lighting was produced by sticking the new lamps into shades and reflectors which had been developed for the old, and which, however good in their original function, were entirely unsuited to the brighter and differently placed filaments of the new lamps. Exactly the same kind of trouble exists to-day in the replacement of the vacuum lamps by the gas-filled type, which again have filaments differently disposed with respect to the sockets and very much higher in intrinsic brilliancy. One has only to make the most cursory inspection of lighting conditions in almost any town to see an astonishing number of cases of misuse of the new lamps, which in themselves are highly advantageous if properly installed. The result of this bad practice in causing accidents is, in Professor Clewell's judgment, a serious matter, and it is high time that remedial measures should be taken and proper shades and reflectors provided to meet the new requirements that have arisen.

Early orders for electrical labor-saving machinery will pay handsome interest before the year is over if current interest in the industrial truck is any guide. The economies of these equipments are capable of absorbing a substantial change in price, should such occur, and a machine at work is productively worth a dozen en route from the factory.

The Microscopic Study of Insulators

WHY insulators break down has been a troublesome problem in the development of electrical transmission. Glass insulators can be inspected for flaws and homogeneity of structure, while the porcelain insulators in almost universal use at high pressures cannot. The paper by Harold G. Tufty in our columns this week gives some clews to the relation of structure and strength in porcelain. This study was made by the familiar method of cutting thin sections of insulator material as in ordinary petrographic work and examining them under the microscope and with polarized light. Polarized light has already been advantageously used in inspecting glass insulators for proper annealing, but here its function was to separate the crystalline from the non-crystalline elements in the insulating material. Ordinarily porcelain insulators are made of a combination of finely powdered quartz, feldspar and ordinary kaolin, the function of the quartz, which is practically infusible at kiln temperatures, being to hold up the structure during firing.

The examination of various samples of insulators, new and old, shows that the quartz has remained entirely unfused, while part of the feldspar has been completely fluxed with the kaolin and the remainder rendered non-crystalline but in part not thoroughly fused with the kaolin. In some of the samples many small particles of unfluxed kaolin were found. It also appears that there may be a very material difference in the proportion of unfluxed feldspar from one part to another of the same insulator. Firing at too high a temperature completely fluxes kaolin and feldspar, leaving the quartz unchanged, and renders the resulting porcelain somewhat porous. Underfiring, on the other hand, leaves a considerable percentage of feldspar unfluxed and leads to a granular rather than a vitreous structure. In the case of several insulators damaged in service the injuries seem to have occurred where the percentage of unfluxed feldspar was low. It would look therefore as if a close study of the relation of firing

temperature to the fusing of the feldspar would be worth while. The three constituents have quite different melting points, and there probably is a fairly close range of temperature at which the best results from the standpoint of permanent usefulness can be obtained.

The results point to the importance of this petrographic method of investigation as a guide to the production of an excellent and uniform material. In these days of precise pyrometry working for certain temperature is comparatively easy provided that one knows what it ought to be. Grinding the necessary sections is not a troublesome matter, nor does the technique of the investigation offer any particular difficulties. Success is simply a matter of going at the work systematically and examining a sufficient number of samples of known history to connect firing temperature and structure with insulating strength.

Differences of opinion as to practice are entirely consistent with complete agreement on principles. When conferences between diverse interests begin with a definition of the area of intellectual overlap, the outlook for a mutually profitable settlement of issues at stake is greatly improved.

On the Wrong Track

LONG before the crack of an assassin's rifle gave the signal for a war that was to embroil all the great and most of the smaller powers and to cause men from New Hampshire and men from New Zealand to fight side by side in European battles it had become a commonplace to say that the world was growing smaller. This process of shrinking has been immensely accelerated by the war. There is no spot on the globe so remote as not to have felt the contraction. The United States tried in vain to maintain its continental isolation. Duty, patriotism and an enlightened self-interest drew it into the conflict, and to-day two million Americans are or have been in Europe of whom in the ordinary course of events only a few hundred would ever have crossed the Atlantic. Foreign affairs can no longer be a matter of indifference. What happens in France, Italy, the British Isles and the conquered Central Powers is vital to America. Far-off Archangel reacts on Arkansas and the fate of the Kameroons has a meaning for Kankakee.

Notwithstanding this undisputed truth, labor leaders and legislators have been found so blind to the trend of their era as to propose that for four years there shall be, save for a few narrow exemptions, a prohibition of immigration into the United States. The contention is that war-time wages must be maintained and that without the proposed law invading hordes of foreigners will force them down.

Now, the wages increased by the war fall under two distinct headings. There are the wages raised only in proportion, a little more or a good deal less, with the increased cost of living, and there are the wages raised to an amount out of all correspondence with the skill or knowledge required to gain them and with the sums paid in other callings. The first kind of wage increase no one wishes to see reduced. Even if prices of commodities revert toward their former level, such wages should stay approximately where they are, for every improvement in the standard of living of great numbers of people is a benefit to the nation at large and only with such improvement can it continue to grow in culture and civilization. The second class of increased wages is another matter. To maintain them, were it possible, would be an injustice to those equally useful in times of peace who do not share them. The clear-headed among those who have been receiving such wages have seen this from the first and have looked upon them as a temporary windfall blown their way by the storm of war.

Disregarding, then, any selfish movement by war's accidental beneficiaries to maintain their advantage, what is the right way to insure that wage increases which are deserved shall be maintained and others of like sort be made? Not, surely, by affronting the nation's allies, shaming its traditions, slamming the door in the face of eager candidates for citizenship and building up a Chinese wall of exclusiveness, but rather by governmental direction and control which shall make it easy for character and hard for crime to gain admittance, easy for industry and hard for sloth, easy for the embryo American and hard for the determined foreigner, easy for the man who wants to go on the land and hard for him who prefers to mount the soapbox. Now as much as ever before imported brawn and skill are an asset to a country with many million acres of uncultivated land and with hundreds of huge building projects of every sort taking shape in the brains of engineers and men of affairs.

Let the recipients of good wages remember that the surest way to keep them from shrinking, the good old American way, is to earn them. Ambition, energy and training will make the product command the price. Dead-leveling of man power and restriction of output in the long run get the workman nowhere. Competence is not afraid of competition, and there is something wrong with the laborers themselves if, abnormal conditions aside, the most highly paid are not the cheapest.

The ability to see all sides of a problem is a marked trait of the successful engineer, who should be called upon more and more to help solve difficulties arising between employers and employees.

Vector Locus Diagrams

THE article in last week's issue on "Long-Line Phenomena and Vector Locus Diagrams," by Edy Velander, presented a number of interesting quantitative results in the form of graphic solutions obtained by strict hyperbolic formulas. The advantage of this method of presentation is that the precedure is mathematically rigid and is not limited to approximations for particular cases of short lines. Of course, the precision is, like that of all graphical work, confined to the scale and geometrical accuracy of the drawing, but where considerable precision is called for computation can be resorted to, following the lines indicated on the diagrams. There is no escape from the proposition that complex hyperbolic functions are bound to come into extended practical use in alternating-current electrical engineering, and the article gives the reader who is not familiar with these functions a general insight into some of their properties.

Engineering Aspects of Industrial Lighting—II*

Economic Considerations of the Accident Rate—Relation to Coal Conservation—Well-Lighted Versus Poorly Lighted Aisles—Desirability of More Widespread and Intelligent Use of Reflectors for All Lamps

BY C. E. CLEWELL
Assistant Professor of Electrical Engineering, University of Pennsylvania

THAT there is an annual loss of the services of more than 100,000 men for an entire year in the industries of this country owing to accidents caused by poor lighting is one of the most startling conclusions brought by a study into the field of accidents and poor industrial lighting during the war[1]. The marked increase in accidents does not necessarily show that artificial light in itself is the cause of the greater accident rate, but that poor artificial lighting conditions may be the underlying cause[2]. This conclusion seems to be verified by the important contribution of R. E. Simpson to the subject. Under the assumption, therefore, that one of the fundamental channels through which accident reduction may be effected is that of improving artificial lighting conditions it is especially important at this time to consider some of the far-reaching conclusions which have come to the attention of the lighting profession within the past year or so under the pressure of war emergency conditions.

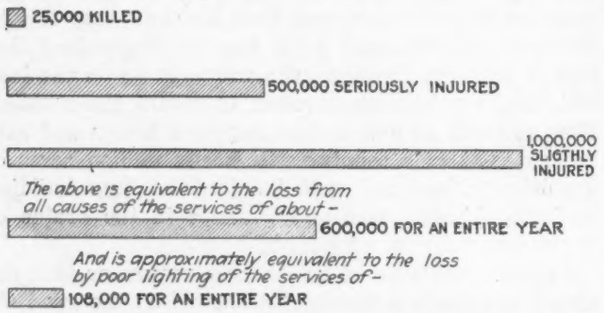
25,000 KILLED
500,000 SERIOUSLY INJURED
1,000,000 SLIGTHLY INJURED
The above is equivalent to the loss from all causes of the services of about -
600,000 FOR AN ENTIRE YEAR
And is approximately equivalent to the loss by poor lighting of the services of -
108,000 FOR AN ENTIRE YEAR

FIG. 1—PROPORTION OF ACCIDENTS IN THE INDUSTRIES ANNUALLY CHARGEABLE TO POOR LIGHTING

ECONOMIC CONSIDERATIONS OF THE ACCIDENT RATE

Mr. Simpson has shown that the total fatal and non-fatal accidents in this country in the industries per annum amount roughly to 25,000 killed or permanently disabled, about 500,000 serious injuries and about 1,000,000 slight injuries. He interprets these figures to mean a loss of the services of something like 600,000 employees for a full year of 300 working days. The significance of these figures is at once apparent, and Mr. Simpson concludes by commenting on the fact that while an economic loss represented by such an "employee time" reduction is not usually felt so keenly because of its distribution throughout the country, any one can at once grasp the full meaning of such figures by imagining this entire labor loss as concentrated in any one of the several important war industries, such as shipbuilding, steel making, munitions or coal mining, in any one of which the total elimination of 600,000 workmen for a year would have been a disaster. (See Fig. 1.)

The foregoing figures stand out very prominently in their relation to the industrial lighting problem when it is considered that in 1910 about 25 per cent of the gross industrial accidents in this country were due directly or indirectly to a lack of proper illumination[3]. From information submitted to the employment management section of the War Industries Board in 1918 it would appear that, while the amount of light used in the industries in 1918 as compared with that in 1910 has probably been increased to some degree at least, the control of the light has received comparatively little attention; that is to say, the use of light-directing devices such as reflectors has not kept pace with the use of increased quantities of light.

This, obviously, represents a very discouraging condition from the standpoint of accident prevention, because if larger lamps have been adopted without suitable reflectors in sockets which previously contained smaller units, the accident hazard produced by glare and its bad effects is probably greater than before. The opinion has been expressed by one authority that if, through labor commissions or other regulating bodies, it would be possible to have every lamp equipped with a suitable reflector, there would be a decided reduction in the number of accidents in the industries of this country.

Taking into account the various factors which have brought about changes in the last eight years, the figure of roughly 25 per cent for the proportion of all industrial accidents chargeable to poor lighting in 1910 has been set at from 18 to 20 per cent for the past year.

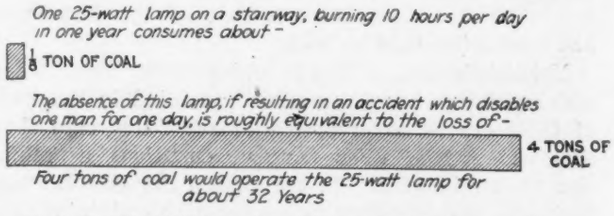
One 25-watt lamp on a stairway, burning 10 hours per day in one year consumes about -
⅛ TON OF COAL
The absence of this lamp, if resulting in an accident which disables one man for one day, is roughly equivalent to the loss of -
4 TONS OF COAL
Four tons of coal would operate the 25-watt lamp for about 32 Years

FIG. 2—RELATIONS OF STAIRWAY LIGHTING TO ACCIDENTS WEIGHTED IN TERMS OF COAL EQUIVALENTS (SEE ARTICLE)

Mr. Simpson, in fact, uses the value of 18 per cent in his paper of October, 1918, and on this basis concludes that the services of somewhat more than 100,000 employees were probably lost in 1918 for an entire year owing directly or indirectly to poor lighting.

As pointed out in an earlier article, the relation of lighting curtailment to coal conservation, while receiving intensified attention during the war, is one which

*First installment of this article appeared in the ELECTRICAL WORLD of Jan. 11, 1919.

[1]See "The Relation Between Light Curtailment and Accidents," R. E. Simpson, before the Illuminating Engineering Society, Oct. 10, 1918.

[2]"Relation of Industrial Lighting to Safety," C. E. Clewell, ELECTRICAL WORLD June 16, 1917.

[3]See paper by R. E. Simpson, *Trans I. E. S.* Dec. 30, 1915.

deserves the most careful consideration during the present period of reconstruction. For this reason brief reference will be made to some figures which are also due to R. E. Simpson (see footnote 1) and which are most significant in their relation to industrial safety.

The general impression among lighting men that industrial lighting should be increased and not decreased during the war was touched upon in a previous article. Various reasons might be advanced as to why this attitude was taken—such, for example, as the decrease in production which might logically have been expected if reductions had been made in the amount of illumination for given factory processes.

Another most instructive way in which to view this situation, however, is to consider the present probable accident rate chargeable to poor lighting and to interpret it into labor equivalents for coal mining. This Mr. Simpson does by showing that the annual services of 108,000 workmen now lost each year because of poor industrial lighting could if saved and applied to coal mining produce 130,000,000 tons of coal. Apparently, therefore, any move to curtail industrial lighting, if it resulted in nothing more than a proportionate increase in the annual industrial accident rate, could be looked upon as the approximate equivalent of the corresponding decrease in the gross labor available

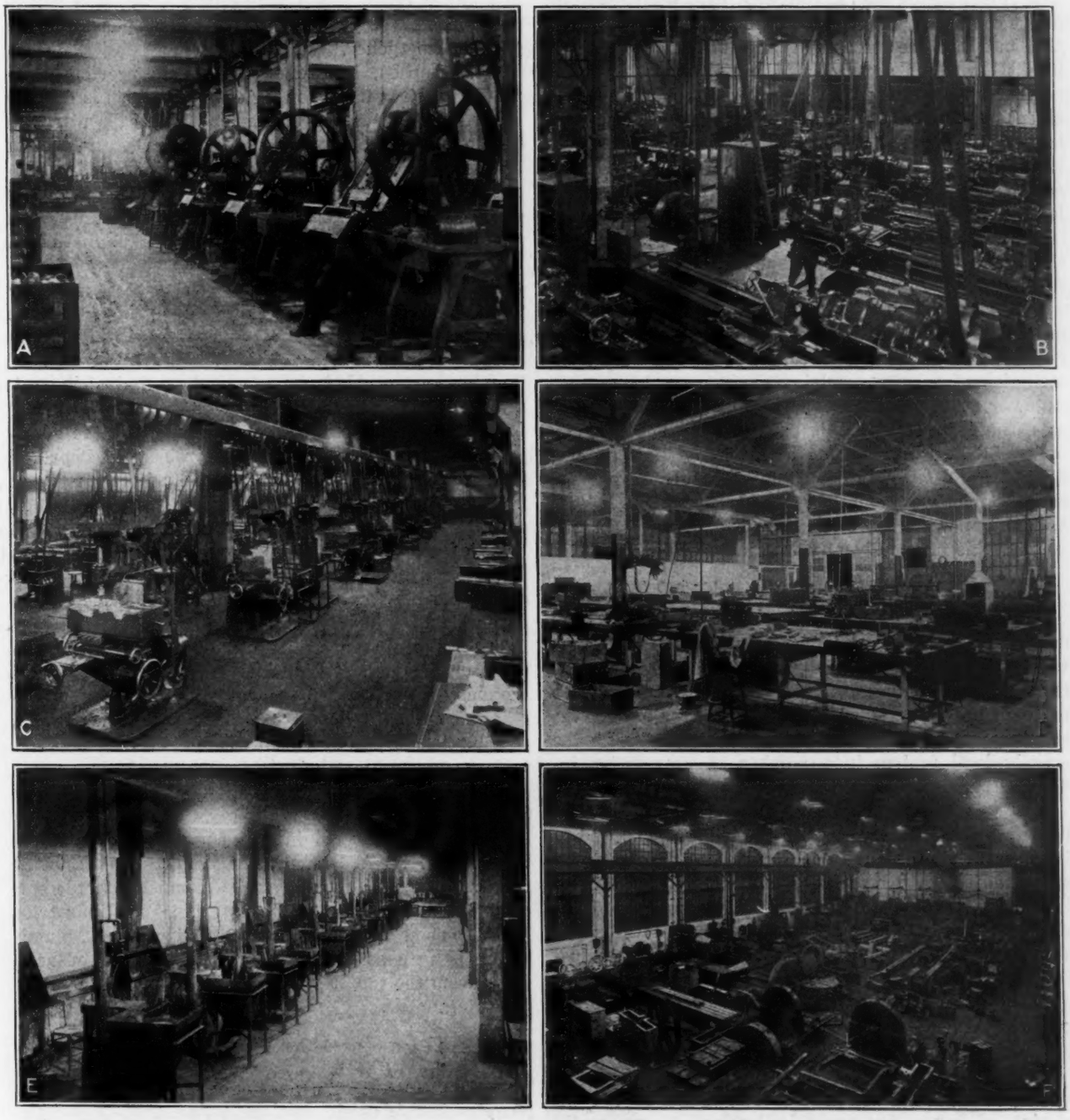

FIG. 3—WELL-LIGHTED SPACES IN WHICH ACCIDENTS DUE TO IMPROPER ARTIFICIAL ILLUMINATION ARE NOT LIABLE TO OCCUR

A—Punch-press shop equipped with 200-watt gas-filled lamps and dome metal reflectors, mounted 10 ft. above floor and spaced 16 ft. apart. B—Mercury-vapor lamps in a section of the Motor Products Company plant. C—Mercury-vapor lamps supplying general illumination in the Dodge plant. D—Bench-work section with general illumination furnished by tungsten lamps. E—Dye tanks illuminated by localized general illumination; 100-watt gas-filled lamps are used with dome enameled-steel reflectors in a row with units 8 ft. apart; note that the entire floor space is well illuminated. F—Section of the Morgan & Wright plant equipped with mercury-vapor lamps; note the even distribution of illumination despite the large amount of material on the floor.

in the country and consequently construed as the equivalent of so much less coal mined.

Looked at from a slightly different angle, it might also be stated that the gross labor shortage of 108,000 workmen per annum due to accidents resulting from poor lighting is in itself equivalent to the labor required for mining more than 100,000,000 tons of coal annually, whereas Mr. Simpson points to the highly important fact that 10,000 tons of coal would provide 108,000 workmen with ample light for ten hours per day for an entire year.

The same authority points to the further fact that a 25-watt lamp burning ten hours per day is adequate for safe illumination on a stairway and would require about one-eighth of a ton of coal per annum. By cutting out this one lamp, as typical of how curtailment might have been accomplished, one-eighth of a ton of coal would obviously have been saved, but a single accident during the year of such a nature as to cause the loss of one man's time for one day represents an economic loss (if interpreted into its coal-producing equivalent) which if prevented could operate the same lamp over a period of thirty-odd years. (See Fig. 2.)

A good illustration of the foregoing is found among the files of information accumulated for the War Industries Board. It relates to a case where an employee was called upon to pass from one room to another in a plant several times a day. The passage between the rooms was infrequently used, and this led to the installation of a large revolving shaft through this passageway near the floor. The incandescent lamp which was usually lighted in this dark passage had been removed in the winter during the period of lighting curtailment, and on one of his trips through the passage the workman was caught by the shaft and killed. The assumption was that if the lamp had been left in this passage this fatal accident would have been avoided.

WELL-LIGHTED VERSUS POORLY LIGHTED AISLES

Considerable attention has been given to the problem of local versus general industrial illumination from a variety of standpoints, and during the last few years the distinct advantages of the general system have been quite definitely established and have resulted in the adoption of this form of lighting in contrast with the strictly local system in a number of progressive industrial plants.

Last year, however, when reductions in light were being seriously contemplated in the industrial as well as in other fields, the question of curtailing the light for spaces adjacent to machinery and merely maintaining the required intensities at the machines was one of the problems faced. The predominating practice of using strictly local lighting in a great many of the industries at this time, notwithstanding the general acceptance on the part of lighting experts of the many advantages of general factory lighting, has been set forth recently by L. B. Marks[4].

Mr. Marks comments in a general way on this point by explaining that the use of local lamps to the exclusion of lamps for general illumination apparently places aisles and spaces adjacent to machinery in comparative darkness. A natural result is an increase in the accident rate, and whereas the common idea is that a majority of the accidents in shops take place at machine tools or at benches, authoritative figures show that about two-thirds of industrial (shop) accidents occur in moving between sections of the shop or when proceeding toward or away from a machine tool or a bench[5].

While the foregoing statement was made in connection with a discussion of probable increases in accident rates if lighting curtailment was applied generally to the industries, the conclusion which may be drawn from it is equally important to the present aspect of industrial lighting under more normal conditions and is another broad lesson which may be classed among those matters which received special emphasis during the war emergency.

Mr. Simpson, in one of his papers previously referred to, gives the following example, which is directly related to the foregoing comment. He calls attention to the prevalence of accidents even in those parts of a shop which are thought of as better lighted than storage and other less frequently used spaces. The case in point was a workbench over which local lamps were installed with proper reflectors for the illumination of the bench surfaces. Owing to the inadequacy of general overhead lamps, a shadow was cast on the floor by the bench causing several accidents due primarily to the falling of unfinished pieces of work which had been stored in the shadow. A higher degree of general illumination would have practically eliminated accidents of this kind.

The general impression seems to hold that the greatest need of the industries in the problem of improved illumination is a more widespread and a more intelligent use of reflectors for all lamps. The need of reflectors, so often emphasized in these columns from the standpoint of economy, thus becomes a vital consideration from the standpoint of accident prevention, and it deserves the most careful attention of the industries in general.

The writer in an earlier contribution in these columns on "Industrial Lighting and Safety" mentioned the many reasons which render light in one way or another a contributory cause to accidents. In other words, the solution is perhaps not so simple as one might at first suppose, although it is probably safe to assume that with more careful attention to the elementary principles of good shop-lighting systems progress may reasonably be expected in this phase of accident prevention. Fig. 3 A, B, C, D, E and F has been selected from a large list of photographs submitted to the employment management section of the War Industries Board to show space in which the distribution of illumination is such as to suggest small likelihood of accidents from the causes which have been set forth in the preceding notes[6].

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[4]Discussion of paper by P. S. Millar, *Trans. I. E. S.*, March 20, 1918.

[5]Mr. Marks refers to the following authorities in this connection: "Industrial Accident Prevention," statement by Mr. Beyer of the Massachusetts Employers' Insurance Association; also *Bulletin* of the Industrial Commission of Wisconsin, Aug. 4, 1915, *Economic World*, Sept. 18, 1915, statement by Mr. Hansen, secretary Workmen's Compensation Service Bureau.

[6]Figs. 3A and E are due to the Edison Lamp Works of the General Electric Company, Figs. 3B, C and F to the Cooper Hewitt Electric Company, and Fig. 3D to the Ivanhoe Regent Works of the General Electric Company. The writer is further indebted to R. E. Simpson of the Travelers' Insurance Company for valuable information relating to this phase of accident prevention. Figs. 1 and 2 have been designed on the basis of data due to Mr. Simpson.

Opportunity Is Here: Let Us Meet It

W Must Grapple with the Problems Involved in Transition from an Old Order to a New Order and Forge Ahead with the Conviction that Success Will Attend Our Efforts

BY L. K. COMSTOCK
L. K. Comstock & Company

THE world of commerce and industry is devoting much time and thought to reconstruction, sanely in some quarters, hysterically in others.

The term reconstruction suggests rebuilding in the same mold as that which has been destroyed by the war. Much that the war has destroyed in the world of ideas, whether in commerce and industry or in philosophy, will not rise again. What confronts us is transition from an old and worn-out order to a new. Because the transition is leading the world into a new order, the outlines of which are indistinct and the details still in shadow, the business world, accustomed to the risks it has heretofore taken, holds back in the face of risks it knows not of.

PRECEDENT NOT A SAFE GUIDE

Some bankers and industrial managers are waiting for prices and wages to fall because they are too high. They are too high—judged by pre-war standards. They may not be too high judged by post-war standards. Those who form conclusions solely from their own experiences have minds that dwell chiefly in the past, and such minds have not the present facts nor far-sighted judgments ready enough at their command to meet the new, changing difficulties of to-day.

During the war wages reached a level all over the world never known before. Labor cost in the last analysis fixes material costs because all materials represent nothing but accumulated labor.

Labor the world over is convinced that this war was labor's war, and labor proposes to reap the harvest. To see that labor is accorded a new—and who may deny a juster?—recognition, witness the gathering at Paris in the neighborhood of the Quai d'Orsay of the leaders of labor from Europe and America. The President of the United States has said that this war was fought to make the world safe for democracy, and Lloyd George, Clémenceau and Orlando have assented. When the President used these words did he have in mind merely an idea, or whole populations dominated by an idea, the idea of democracy? Translated from political terms into commercial and industrial terms, this means an admission of labor into partnership with capital. But, since labor is its own best customer, it must learn how to operate with its newly recognized partner, capital, so that both shall derive from the partnership maximum benefits.

These two partners have got to view each other with less suspicion; they have each got to try to visualize the other's situation. Capital must teach, not patronize, and labor must hold up its head and say, "I am an American citizen, and I want my share of the good things of life but no more." Autocracy's day in industry, no less than in government, is over.

Labor will not submit without a struggle to any decrease in real wages. In public speech labor says:

"The American labor movement will coöperate with all other agencies to help in this reconstruction time. Our movement is not to destroy, but to construct; but all may just as well understand now as at any other time that the advantages which the workers of America and of the allied countries have gained, and which we hope to extend to the people even of the conquered countries, are not going to be taken away from us, and that we will resist to the uttermost any attempt to take them away."

While it is true that organized labor at present represents not more than 10 per cent of all labor, and still a smaller percentage if managerial and directing brain work is included in the term labor, yet that 10 per cent is organized and skillfully directed, and therefore its power is vastly out of proportion to its numbers. If labor must make a struggle to maintain the present level of real wages, a disaster is in store for the industrial world. It is true that some wages are too high and it is equally true that some are too low, when wage purchasing power is considered, and also if the pre-war measuring stick is used as the unit of measure.

In proportion as labor is organized and skillfully directed, it places itself directly in opposition to the operation of the old theoretical law of supply and demand. This law has frequently been blocked in its operation by both governments and organized labor, not to speak, even softly, of combinations of capital.

Its operation without let or hindrance is hardly to be expected again, except in the broadest sense. In proportion as the transition to a new order spells cooperation, as distinguished from competition, the industrial world will consign the law of supply and demand, as commonly understood, to the limbo where repose many other skeletons of the Manchester school of economists.

LAW OF SUPPLY AND DEMAND

When there is a scarcity of labor there will be little or no competition, but when labor is plentiful the competent will displace the incompetent labor, and to this extent the law of supply and demand will work, although the rate of wages remains fixed; and in this way production will be increased and therefore cheapened, notwithstanding the wage rate remains unchanged. But if cost of production is to be kept down, something more is required which will give to the wage earner a direct interest in the success of undertakings as a whole.

Transition to a new order will be vain if all parties do not gain something—for the idea of democracy embraces not only labor but capital also.

The electrical industry, as well as the whole industrial world, should move forward unafraid, determined to carve its fortunes out of the future without fear and trembling. There will be no return to "normal" as it

existed in pre-war days. A new normal is ahead—but, better expressed, a new order is ahead.

PROSPERITY'S RELATION TO RISING PRICES

Prosperity, a word expressing the well being of the industrial and commercial world, has from time immemorial been associated with rising and higher prices. High prices have been usually accompanied by a reciprocal change in the price of gold, and this phenomenon has been coincident with, if not caused by, the production of new stocks of gold in excess of new demands. These events move in circles, and the faster the movement the greater the industrial and commercial activity; and so prosperity is only another expression for activity. Conversely, falling prices—gold appreciation—have always been associated with declining prosperity and business inactivity. And then inflation—paper money—must be considered in its effect on prices. Many billions of dollars of additional money have been issued, and this alone would have a tendency to keep prices up probably for several years, and very likely on or near to the war level.

The period of transition upon which we are entering should not proceed far without centering the attention of far-sighted and wise business men and economists, not only in the electrical but in all industry, on comprohensive plans for properly housing wage earners. The social well being of the wage earner is no less the object of industry than prosperity. For it is not difficult to show that a higher standard of living is a prerequisite of increased production.

The psychology of the business world is such that the units of which it is composed at times of stress and strain—and the present transition is such a period—need stimulation and prodding.

The government, which has been the chief purchaser of labor and materials for the last two years, ought during this transitional period to take the lead and lend its influence as a stabilizer by constructing directly or indirectly public works, such as roads, canals, irrigation works, buildings, hydroelectric plants, housing schemes and other enterprises. The already overburdened taxpayer is heard to object to this plan of government activity or coöperation by saying the national debt is now too great by far to admit of any increase.

There is a vast difference, however, between creating a national debt for an unproductive purpose and creating one for a productive purpose. In one case a loss is incurred when the expenditure is made, and in the second case the government collects money from one set of persons and pays it to another set of persons, and capital handled in this manner is just as available for use in industry in the hands of one set as in the hands of the other; but during the operation the wheels of industry are kept moving until the present sluggishness of the business world is shaken off and courage has returned to take up the post-bellum burdens. There should be sufficient business leadership in the government to take up the lost motion inevitable at the beginning of a great transitional period.

The public debt, even though it be not reduced a dollar, will grow relatively smaller as industry increases production. All industry properly directed increases production, and it is the daily increase in production that increases individual as well as national wealth. Every discovery that makes labor more productive increases the average individual income and decreases the importance of debts.

The Bolsheviki, who seized property, made the mistake of thinking that property is wealth, but they are rapidly discovering that the seized properties have no value except as agencies for producing wealth.

America emerges from the war industrially and commercially stronger than it ever was before. It has become the great creditor nation, and to it now come the manifold obligations belonging to a great creditor nation. It has prodigious capacity for manufacturing steel, brass, electrical apparatus and supplies, machinery and every kind of equipment which the whole world wants; but in order to take advantage of this singularly fortunate position, it must be prepared to do its part as a creditor nation and finance all kinds of construction work and commercial enterprises, taking pay in proprietary interests and foreign securities.

The business outlook is good from every point of view, but advantage of position cannot be translated into activity and resultant profits by lack of courage and industrial timidity. The electrical industry, American business, must grapple with the problem and move forward with a bold stride. It must not turn back and yearn for pre-war prices, but confidently forge ahead with the conviction that success will attend its efforts. Fortune favors the brave. There are fifty persons who can figure out sure failure to one who pushes on without thinking of the possibility of failure.

We shall have new conditions to consider and problems to solve; but it is the American business man's job to go forward to meet the problem and meet it more than half way. To wait for prices to fall is unwise, cowardly and economically unsound, for this process carried to its logical conclusion would result in stagnation and ruin.

A NOTE OF OPTIMISM

All the elements of prosperity are here. We should lose no time in accepting that fact. The factors making for prosperity are all present and accounted for. We must not wait to debate about prices and wages, for these considerations are but the minor factors in the general situation; it might even be said they are no factors at all. The situation might be likened to the turning of the waters of the Chicago River up stream twenty years ago. While the engineers were at work getting things ready for reversing the stream, orators and writers were busy foretelling the dire things that would happen when Lake Michigan should go dry by pouring all its waters through the Chicago River spout at the rate of four miles an hour. Calculations were made of the length of time required for emptying the lake. Calculations were made of the certain decrease in the amount of water pouring over Niagara Falls. The day finally came for reversing the stream. The waters immediately flowed gently up stream, and Lake Michigan after twenty-odd years is still there in all its plenitude and glory, and Niagara Falls is still falling.

What turned the stream flowing in the opposite direction was the opening of the locks. Let the government open the locks of industry and the stream will begin to flow, gently, and the transition period will start.

Combustion of Lignites and High-Moisture Fuels

Typical Analyses of High-Moisture Fuels of the United States and Canada and Summary of Experience Derived from Burning Fuels of the Kinds Described in Power Plants

BY T. A. MARSH
Green Engineering Company

AMONG the lowest grades of fuels with which combustion engineers must work are the lignites and high-moisture fuels. Many of these fuels contain more than 40 per cent of moisture and less than 6000 B.t.u. when mined. From such fuel it is evident that even after obtaining satisfactory combustion the net heat delivered to the boiler is small, owing to the low initial heating value and the loss from evaporation of the moisture in the coal. The problem has presented such difficulties that there is a prevalent opinion that lignites cannot be successfully burned. It is the purpose of this article to describe methods of burning these fuels and results obtained in their combustion.

The lignite deposits of North America occur in five main areas: (1) North territory and Alaska, (2) Alberta and Saskatchewan, (3) North Dakota and Montana (Fort Union region), (4) Texas (Texas region), and (5) Mississippi and southern Alabama (Mississippi region). The lignite areas of the United States are indicated on the map. There are, in addition to these, other areas in Wyoming and Colorado bearing high-moisture coals (20 to 30 per cent) which will also be discussed in this article.

Lignites contain on the average from 20 per cent to 40 per cent of moisture when mined. These fuels have a spongy structure and woody fiber. They slack on the surface within a few hours when exposed, the action being very similar to that of lime when slacked. The drying process, unfortunately, does not penetrate deeply into the pile, but is a surface action. On account of the high percentage of moisture and the slacking property of lignite, it cannot be successfully transported far from the field where it is mined. This has, of course, limited the utilization of this fuel.

Combustion of high-moisture fuels may be divided into two distinct processes, (a) the drying of the fuel, (b) the burning of dry fuel. There are two methods of approaching this problem. They are: (1) By pre-drying the fuel before it enters the furnace; (2) by drying the fuel in the furnace.

Pre-drying lignite at such rates as are desired in most plants is a prohibitive procedure both on account of the apparatus involved and the cost of coal for the process. Unless, therefore, some waste-heat method of pre-drying is developed, there is little to be hoped for along this line.

All furnaces which successfully burn lignite have in them elements or features designed to dry the fuel, preparing it for the latter stages of combustion. Evaporation can occur only from the surface as the fuel burns, leaving exposed the more moist fuel below to dry and burn. This necessitates thin fuel beds. Every one having experience with lignites is familiar with this fact. With hand firing it is difficult to keep the fire thin enough and at the same time free from holes. Two types of stokers are successfully burning these fuels: They are: (1) The plain chain grate and (2) the chain grate with inclined coking plates.

On a plain chain grate the volatile gases burn off rapidly after the fuel is dry, leaving a bed of fuel burning with little flame, similar to charcoal. This burns out to a fine light-white ash. On the type with inclined coking plates excellent results are secured with lignites. In fact, this type of stoker is admirably adapted to these fuels. The coking plates tip the front part of the fuel bed up at an angle to the hotter portion of the fire and ignition is thus hastened. The incline serves as a drying region, and the stirring action obtained by the fuel cascading over coking plates serves to expose practically all surfaces of the fuel to the drying action of furnace temperatures. The fuel, therefore, reaches the grate ignited and ready for rapid combustion.

With these fuels, extremely high draft is not essential for high combustion rates, as it is possible to burn liberal amounts of "coal as fired" per square foot of grate per unit of draft. Below is a rough estimate of the relation of the draft in the furnace to the combustion rates of coal as fired:

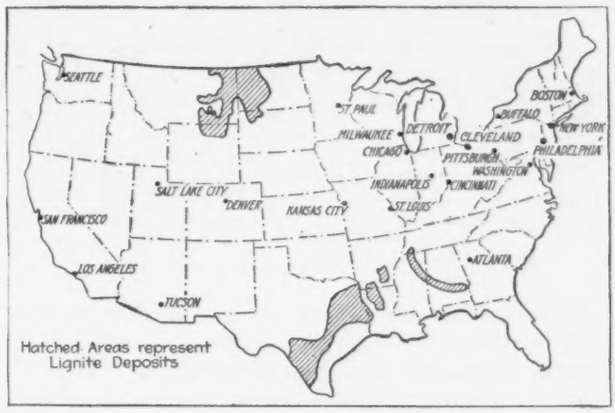


FIG. 1—REGIONS IN WHICH LIGNITE IS FOUND IN THE UNITED STATES

Lb. Coal as Fired per Square Foot of Grate Surface per Hour	Furnace Draft, Inches of Water
10	0.16
20	0.15
30	0.25
40	0.37

In all calculations of draft involving areas of boiler passes, flues and chimneys allowance must be made for the high rate of coal per horsepower which prevails with these fuels. For instance, if Malakoff lignite containing 7124 B.t.u. is burned at 71.3 per cent efficiency it requires 6.6 lb. of coal as fired per horsepower developed. All calculations should therefore be based on pounds of coal and not on any predetermined table or rules based

on horsepower developed. It has only been within the last five years that furnaces have been developed to burn these fuels successfully. Moreover, so little has been said regarding this development that many are still uninformed regarding the results that can be obtained from these high-moisture fuels.

A typical analysis of North Dakota lignite follows:

Moisture, per cent	41
Volatile, per cent	24
Fixed carbon, per cent	27
Ash, per cent	8
B.t.u. (commercial)	6,241
B.t.u. (dry basis)	11,932

On account of its high moisture content no successful commercial method has been found for burning this fuel. Large areas of it are waiting the further development of the art of combustion.

That part of the Dakota lignite field which extends beyond the Canadian border however, bears lignites enough lower in moisture to make possible their successful combustion. The lignite of this field is called "Souris lignite." A typical analysis follows:

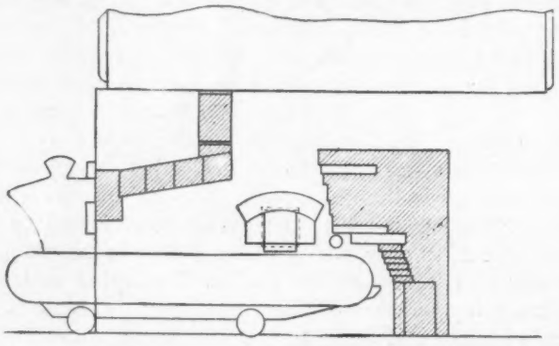
Moisture, per cent	29.7
Volatile, per cent	30.3
Fixed carbon, per cent	31.0
Ash, per cent	9.0
B.t.u	10,770

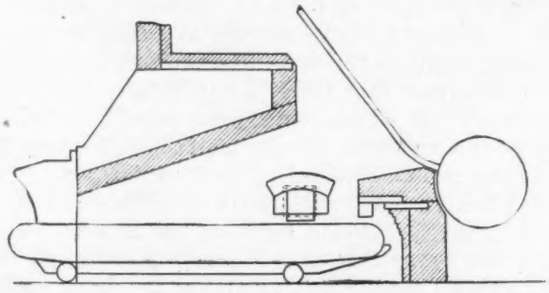
This fuel is being successfully burned in many plants equipped with chain grates. Large grate areas are, of course, necessary. The ratio usually is at least 1 sq.ft. of grate area for each 30 sq.ft. of water-heating surface. A type of furnace successfully burning this fuel is shown in Fig. 2.

There are some important elements in this furnace which may be discussed: First, a liberal igniting arch must be provided; second, there should be a vertical bridgewall or preferably an arch at the rear, reflecting the heat forward and deflecting the gases forward over the fuel. Such a furnace will ignite and burn 30 lb. of Souris lignite per square foot of grate area per hour (145 kg. per sq.m.).

The lignites of Colorado do not contain so much moisture as those lignites already discussed; 30 per cent is about the maximum percentage of moisture found in fuel of this district. Pike View lignite, an analysis of which is given below, is typical. Danville lignite contains a higher percentage of ash and slightly lower moisture than Pike View. Both are found in the Colorado Springs district.

	Pike View Lignite
Moisture, per cent	23.73
Volatile, per cent	35.25
Fixed carbon, per cent	33.23
Ash, per cent	7.79
B.t.u. (commercial basis)	8,511
B.t.u. (dry basis)	1,116

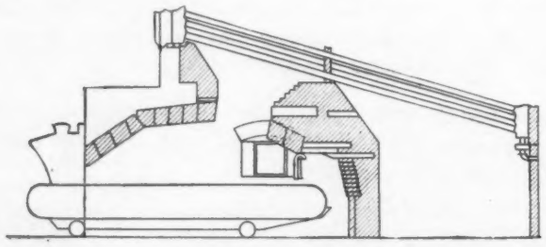


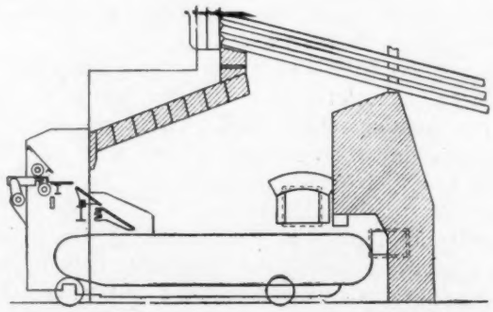


FIGS. 2 AND 3—IN THESE INSTALLATIONS THE FURNACE VOLUMES ARE 224 CU.FT. AND 1383 CU FT RESPECTIVELY, THE GRATE AREAS 42.5 SQ.FT. AND 156.4 SQ.FT., AND THE FURNACE VOLUMES PER SQUARE FOOT OF GRATE AREA 5.25 AND 8.85 RESPECTIVELY

Several years ago furnaces were developed that would burn these fuels at good combustion rates, but results from modern furnaces would appreciably surpass the rates obtained then. In furnaces that were developed eight years ago the following results were obtained from Pike View lignite:

Type of stoker	Green chain grate
Type of boiler	Babcock & Wilcox
Coal per square foot per hour, actual lb	28
Furnace draft	23.2
CO_2 at damper in per cent	12
Per cent rating developed	128
Combined efficiency	69.7





FIGS. 4 AND 5—IN THESE INSTALLATIONS THE FURNACE VOLUMES ARE 565 CU.FT. AND 662 CU.FT., THE GRATE AREAS 138 SQ.FT AND 88 SQ FT., AND THE FURNACE VOLUMES PER SQUARE FOOT OF GRATE AREA 4.1 AND 7.5 RESPECTIVELY

Many plants are using this Colorado fuel. A typical installation in one of these plants with Stirling boilers is shown in Fig. 3. This setting is giving high combustion rates and high efficiencies from these high-moisture fuels.

The vast lignite fields of Texas are practically undeveloped. In this section of the country lignite must compete with coals of Texas, as well as those of Arkansas, Oklahoma and New Mexico. Moreover, oil and

natural gas are cheap. With these fuels available, the development of furnaces for burning lignite has naturally been retarded. Many of these lignites have, however, been burned with excellent results on chain grates.

A design of furnace developed for these fuels is shown in Fig. 4. This furnace has, in addition to the ignition arch, a reversed arch from the bridgewall, bringing the heat forward over the fuel bed. This feature is recommended for the combustion of lignites. Some typical data concerning the characteristics of this fuel and its combustion with this furnace follow:

	Malakoff	Treadlow
Moisture, per cent	29.93	29.80
Volatile, per cent	30.96	31.34
Fixed carbon, per cent	25.45	23.71
Ash, per cent	11.66	13.15
B.t.u. (commercial)	7,124	6,906
B.t.u. (dry basis)	10,314	9,838

	Malakoff	Treadlow
Type of stoker	Green chain grate	Green chain grate
Type of boiler	Babcock & Wilcox	Babcock & Wilcox
C_2O at damper, per cent	11.81	12.2
Coal per square foot per hour, lb.	30.6	31.6
Draft in furnace	32	24
Combined efficiency, per cent	71.3	69

Some interesting results have been obtained with the coking chain grate. Such a grate, shown in Fig. 5, has in addition to the usual horizontal chain-grate surface, an inclined coking plate, approximately 3 ft. (90 cm.) in length. When burning lignites this inclined surface serves as an excellent drying zone. Tipped up as it is at an angle to the hotter portion of the fire at the rear, drying progresses rapidly so that by the time the fuel has reached the horizontal chain surface the moisture has been driven off and the fuel has become thoroughly ignited. This method of burning lignites offers possibilities.

Using the same type of furnace as shown in Fig. 5 the inclined coking-plate stoker gives results like these:

Name of fuel	Calvert (Tex.) lignite
Moisture, per cent	30.16
Volatile, per cent	38.33
Fixed carbon, per cent	24.03
Ash, per cent	7.48
B.t.u. (commercial)	7,462
B.t.u. (dry basis)	10,669
Kind of boiler	Babcock & Wilcox
Kind of stoker	Green "L" type, chain grate
Coal per square foot of grate per hour, lb.	36.4
Furnace draft	34
CO_2 at damper, per cent	11.2
Combined efficiency, per cent	67

Considering that the moisture content of these fuels is from 25 per cent to 30 per cent, the efficiencies of from 69 per cent to 72 per cent are creditable, as it is evident that it is not possible to obtain the high efficiencies from these fuels that can be obtained from low-moisture fuels. Such fuels as Calvert lignite with 30 per cent moisture require 372 B.t.u. per pound simply to evaporate the moisture which is in the fuel and heat the resultant steam to a temperature of 500 deg. Fahr. (assuming a temperature in the boiler room of 80 deg. Fahr.). The heat thus used is 5 per cent of the total heat in the fuel as fired and must detract directly from the efficiency of steam generation.

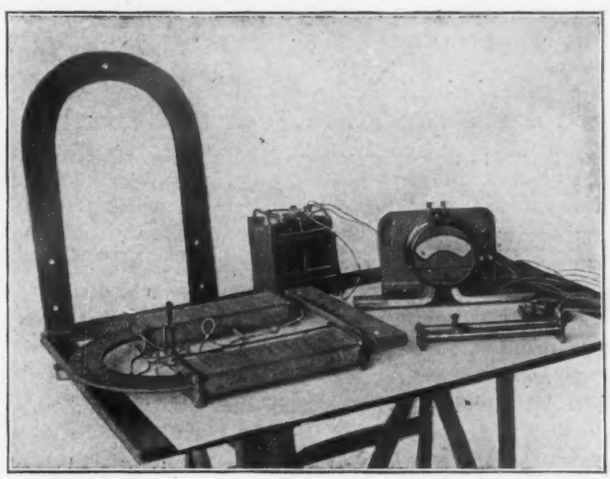
With established results of from 69 per cent to 72 per cent efficiency and with many plants successfully using lignites containing as high as 35 per cent moisture and 6800 B.t.u., plant owners, engineers and designers in localities where these fuels are involved can confidently assume that lignites can be burned satisfactorily.

TESTING PERMANENT MAGNETS BY MEANS OF A VOLTMETER

Magnetometer May Be Devised by Modifying a d'Arsonval Type Voltmeter — Descriptions of Useful Tests

IN DEVELOPING apparatus requiring permanent magnets the National Safety Appliance Company of San Francisco found no suitable magnets on the market and undertook to design, build and test large horseshoe magnets suitable for the work in hand. A direct-current voltmeter was readily rearranged for use in making comparative tests of the permanent magnets. A description of this device, together with the magnetizing process, may be of interest to those concerned with the testing of permanent magnets.

After some experiment it was decided to make the magnets of several laminations of ⅜ in. by 3 in. by 60 in. (9 mm. by 7.6 cm. by 152 cm.) forged magnet steel bent into "U" shape and securely bolted together without air gaps between the laminations. The laminations



APPARATUS FOR MAGNETIZING AND TESTING IRON

were bent with the 3-in. (7.6-cm.) face parallel to the plane of the "U."

The laminations are tempered separately in an oil bath and are made as hard as possible without causing fracture. They are then magnetized by being put in a pair of rectangular coils 15 in. (38 cm.) long, each containing 3775 turns of No. 18 double cotton-covered magnet wire. With the two coils in place a soft-steel keeper having the same cross-section as the magnets is bolted across the ends of the "U," which project beyond the coils. Thus the magnetic path through the two energizing coils is completed to give the maximum flux density.

The magnetizing coils are connected in multiple to the 125-volt direct-current line through a variable resistance and reversing switch. With the circuit closed and all resistance cut out a current of 12 amp. flows through the coils. This maximum current is rapidly reversed several times by the polarity switch and then gradually reduced to zero by means of the variable resistance. It has been found by experience that the sudden shocks of reversed polarity exert a more powerful magnetic influence than is secured by a single charge in one direction only. Under this plan the magnetiza-

tion of a single lamination is completed in about thirty seconds.

Having magnetized the iron in this way, the next problem was to find means for testing the magnetic strength. No suitable instruments were found on the market so a magnetometer was build up from a direct-current voltmeter from which the permanent magnet had been removed. Soft Norway iron pole pieces were fitted to the instrument, their outer ends projecting beyond its base and the inner portion connected in such way as to take the place of the magnet supplied with the instrument. These pole pieces were long enough so that they would span the open end of the "U" magnets. Tap bolts were used to attach the magnets to the pole pieces so that good contact was assured. A current of known strength was then caused to pass through the moving coil of the instrument, and the deflection of the pointer was read as directly proportional to the magnetic field set up by the magnet on the pole pieces.

The magnetometer scale was divided into 100 spaces for convenience in taking the reading in terms of percentage above or below the strength of any magnet adopted as standard.

The laboratory work on these magnets was done by F. V. Chittenden under the direction of F. F. Bostwick, president of the National Safety Appliance Company.

Photographic Study of Porcelain Insulators

Polarized Light Employed in Examination of Thin Sections of Insulators Some of Which Had Been Properly Fired While Others Were Underfired and Still Others Overfired—Observations on Used Insulators

BY HAROLD G. TUFTY
Research Department, University of Wisconsin

PRELIMINARY studies of insulators through the use of polarized light have been made at the University of Wisconsin under the direction of Profs. Edward Bennett and A. N. Winchell. Briefly the procedure in these studies was to examine thin sections of the insulators about 0.03 mm. thick under the microscope in both natural and polarized light. The polarized light was obtained by inserting two Nicols prisms in the path of the light. In this test sections were examined from flange pieces of 10-in. (25-cm.) insulators received from the Ohio Brass Company and from complete 10-in. (25-cm.) insulators received from the Union Electric Light & Power Company of St. Louis, Mo. This study is thought to be interesting as indicating a possible means of discovering some causes of insulator failure.

In the examination of the insulator sections certain constituents received more detailed study than others. Feldspar received the most careful study. In all cases its percentage and condition were carefully determined. The quartz received considerable attention in the first few sections, but its condition seemed so constant that its study was soon abandoned. The function of the quartz in an insulator is to retain the shape during firing. The remaining constituent of the insulator is kaolin. This substance is isotropic or glassy and is therefore invisible between crossed Nicols prisms.

The numbers printed in Fig. 2 are the numbers of the various sections studied. In each of the types the underlined section will be taken as a typical example and will be explained in detail. In cases where one description is not sufficient several sections will be described. In all the discussions the photographs will bear the number of the sections they represent. A subscript *o* indicates that ordinary light is employed in the photographing, while a subscript *p* indicates that polarized light is used.

The photographs Nos. 1_o and 1_p of section No. 1 show the appearance of a "good" insulator, which gave satisfactory service for nine years. It had not failed at the time of examination.

The photographs show a fairly even distribution of the constituents in the porcelain. In photograph 1_o the brighter particles are quartz, while those which have a more mottled appearance are feldspar. The feldspar as it appears in all the sections has lost its crystalline structure but not all of its original form. The feldspar will therefore be invisible between crossed Nicols prisms, while the quartz, which is crystalline, will be visible. Ordinary light was used in photographing No. 1_o, and as a result both the feldspar and the quartz are visible. In photographing number 1_p polarized light was used, and consequently the only constituent that is visible is the quartz.

The average diameter of the quartz grains shown in two photographs is about 0.0272 mm. Quartz grains were found as large as 0.0816 mm., but there were so few of them of this size that it did not seem worth while to estimate their quantity. The percentage of quartz in the photographs is 13.

During firing some of the feldspar had evidently fluxed with the kaolin to form a glassy matrix, while the remaining portion retained in part its original form. In some cases the boundary between the unfluxed feldspar and the matrix was difficult to determine. This condition introduces a possible error in the determination of the percentage of feldspar, but these cases were so few in number that the condition was not serious. The percentage of feldspar in this section is 28.

In photograph No. 1_o a careful examination will reveal numerous black particles. These particles are believed to be unfluxed kaolin. The number of particles in this section will be taken as a standard for comparisons made with the other sections. At first it was believed that the black particles might have come from the sawing of the insulator while preparing the section. Sections Nos. 20 and 21 were made from pieces of the insulator that were broken instead of

being sawed. An examination of these slides revealed the same number of black particles that section 1 had. This fact was sufficient evidence to show that the black particles were not a form of contamination.

The crack in section 1 that can be seen in both photographs No. 1_o and No. 1_p is a defect overlooked during manufacture. This defect is so far from the cap of the insulator that it did not have a material effect on the insulating quality. The fracture of the porcelain represented in this type is a smooth, finely granular, non-vitreous break.

Section 4 is an example of a perfectly fired insulator. Its fracture is very finely granular and slightly silky. A comparison between sections 4 and 11 yields surprising results. In both cases the percentages of feldspar, the appearance of the matrix and the quartz and the number of black particles are the same.

Type No. 2 was in service nine years before it was cracked. The information that accompanied the insulator specimens gave no explanation regarding the cause of cracking or the conditions under which this specimen broke. Two sections of this insulator were made, one near the crack and the other at a short distance from it. Both sections appear the same in evenness of field, distribution of quartz and size of grains. There is a difference in the percentages of feldspar of the two sections. The section near the crack has 12.1 per cent of feldspar, while the section a few inches from it has 19.7 per cent. These few cases are not enough to draw definite conclusions from, but it seems as if the quality of the insulator depends on the quantity of unfluxed feldspar present. There are about half as many black particles in this section as there are in section No. 1. The fracture of this insulator was finely granular, and it lacked silky luster.

Type 3 was an overfired insulator. The photographs 6_o and 6_p of section No. 6 show the harmful effects of overfiring. The temperature of overfiring is not known, but it must necessarily have been below 1625 deg. C.—the fusing point of quartz—because the quartz shows no signs of fusion even on the sharpest points. The porosity of quartz in this section is 14.1 per cent. The quartz seems to have no bearing on the quality of the insulator. Even at the high temperature of overfiring there are no visible changes in the quartz. At the high temperature of firing the feldspar was completely fluxed, and consequently its percentage is 0. The black particles are practically absent in this section. The fracture of a piece of overfired porcelain is slightly brownish in color. A magnifying glass will reveal long narrow pores. The alignment of the pores follows very closely the outer surface of the insulator.

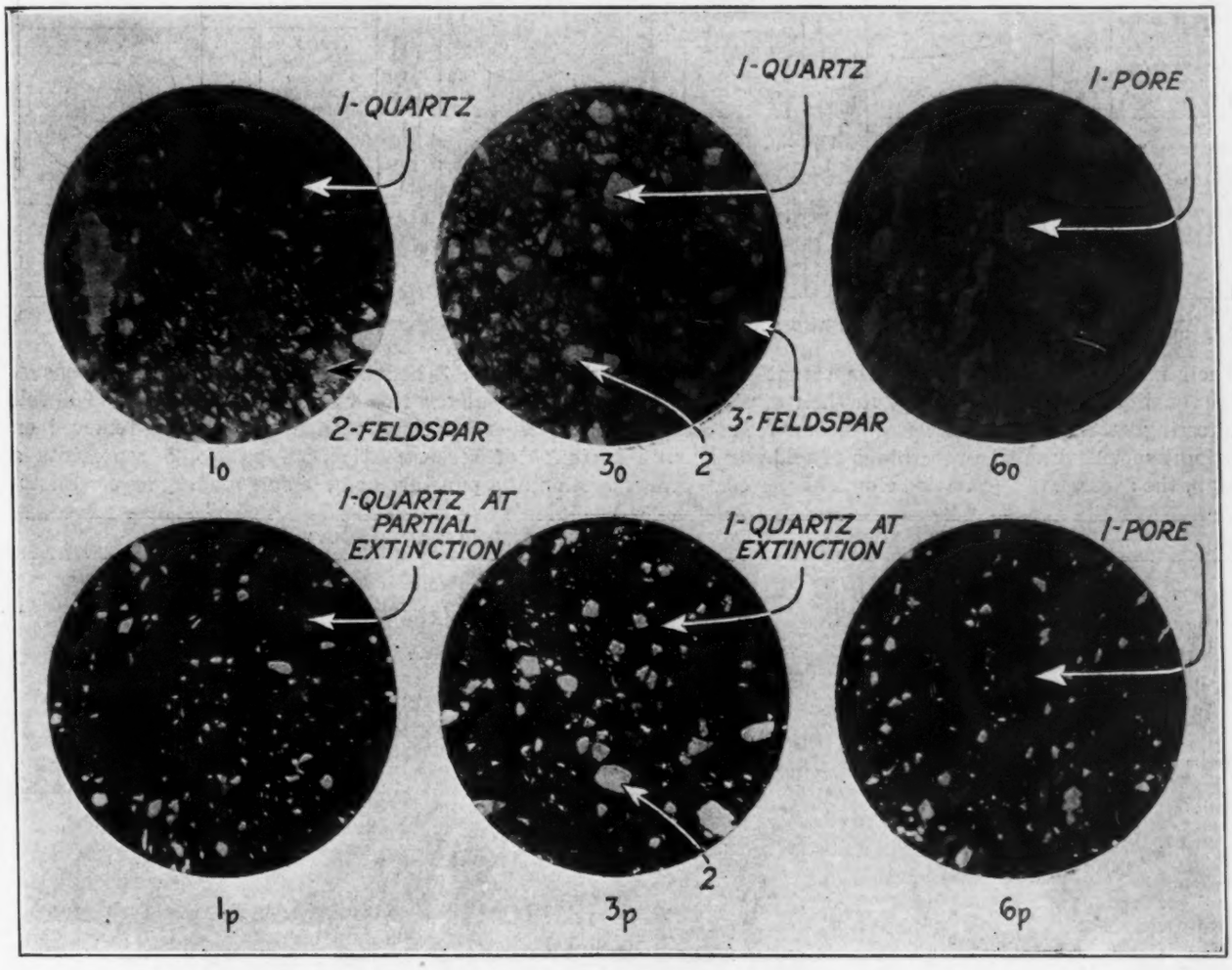


FIG. 1—PHOTOMICROGRAPHS OF INSULATOR SECTIONS REFERRED TO IN FIG. 2 UNDER ORDINARY AND POLARIZED LIGHT (600 DIAMETERS)

Type 4 was underfired, photographs Nos. 3_o and 3_p showing the results of underfiring. The most important feature of this section is the number of black particles present. The abundance of these particles seems to have a direct relation to the temperature of firing.

Insulator No. 1 was the line disk of a string of eight insulators supporting a 100,000-volt line over a substation roof. It had been in service for five years and two months. Insulator No. 2 had been in service in the same string as No. 1 but on the ground side.

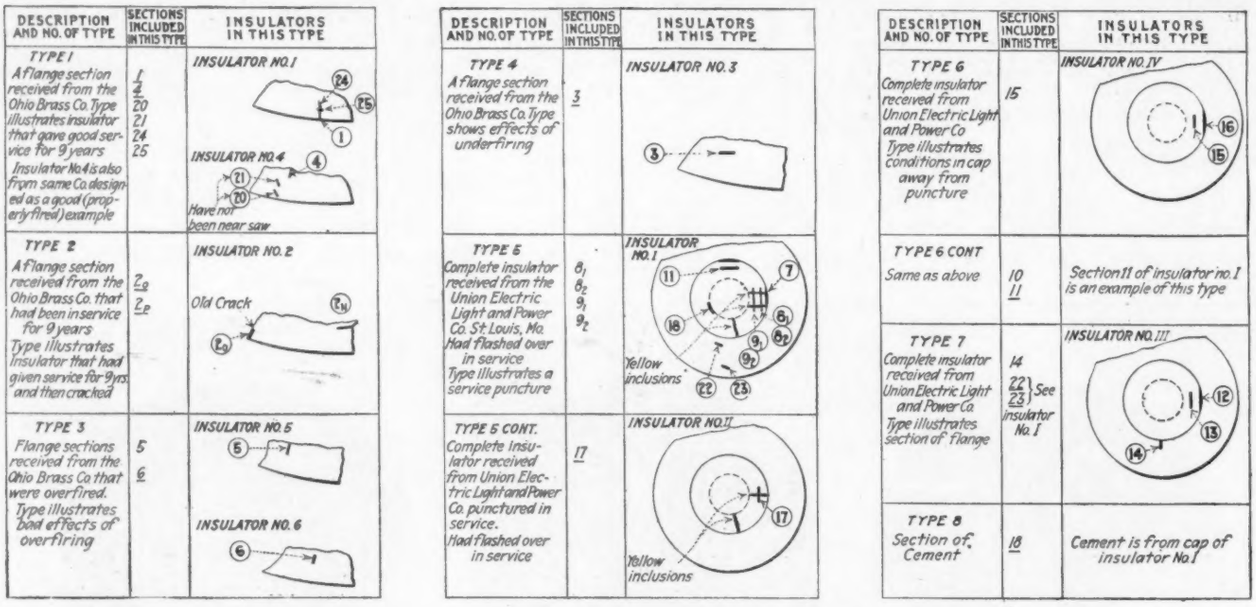

DESCRIPTION AND NO. OF TYPE
SECTIONS INCLUDED IN THIS TYPE
INSULATORS IN THIS TYPE
TYPE 1
A flange section received from the Ohio Brass Co. Type illustrates insulator that gave good service for 9 years
Insulator No 4 is also from same Co. designed as a good (properly fired) example
1 4 20 21 24 25
INSULATOR NO. 1
INSULATOR NO. 4
Have not been near saw
TYPE 2
A flange section received from the Ohio Brass Co. that had been in service for 9 years
Type illustrates Insulator that had given service for 9 yrs. and then cracked
2o 2p
INSULATOR NO. 2
Old Crack
TYPE 3
Flange sections received from the Ohio Brass Co that were overfired.
Type illustrates bad effects of overfiring
5 6
INSULATOR NO. 5
INSULATOR NO. 6
TYPE 4
A flange section received from the Ohio Brass Co. Type shows effects of underfiring
3
INSULATOR NO. 3
TYPE 5
Complete insulator received from the Union Electric Light and Power Co. St. Louis, Mo. Had flashed over in service
Type illustrates a service puncture
8₁ 8₂ 9₁ 9₂
INSULATOR NO. I
Yellow inclusions
TYPE 5 CONT.
Complete insulator received from Union Electric Light and Power Co. punctured in service. Had flashed over in service
17
INSULATOR NO. II
Yellow inclusions
TYPE 6
Complete insulator received from Union Electric Light and Power Co
Type illustrates conditions in cap away from puncture
15
INSULATOR NO. IV
TYPE 6 CONT
Same as above
10 11
Section 11 of insulator no. I is an example of this type
TYPE 7
Complete insulator received from Union Electric Light and Power Co.
Type illustrates section of flange
14 22 23 See insulator No. I
INSULATOR NO. III
TYPE 8
Section of Cement
18
Cement is from cap of insulator No. I

FIG. 2—BRIEF DESCRIPTIONS AND LOCATIONS OF INSULATOR SECTIONS EXAMINED, WITH COMMENTS

Their number seems to have no important bearing on the quality of the insulator, but their study is interesting as the number seems to be an index of the firing temperature. The percentage of feldspar is quite high, the average of the trials being 24.7 per cent. The fracture of the insulator described is coarsely granular and has a dull powdered appearance.

Insulator No. 3 had been in service on a suspension tower. Insulator No. 4 was taken from a 13,000-volt line dead-ended on wooden arms. It was removed on account of reconstruction. Type No. 5 represents a section of a puncture and the surrounding area. Photographs Nos. 17_o and 17_p of section No. 17 are views of a puncture and a part of the surrounding area. In photograph No. 17_o the region of the puncture is in the upper part of the picture where the section seems to be lighter. This increased transparency of the section is due to a more complete fluxing of the feldspar and kaolin. Photograph No. 17_p shows the same view, but here the quartz is the only visible constituent, since both the other constituents are isotropic. In both photographs the edges and points of the quartz are sharp, even in the upper part of the section where the breakdown occurred. This shows that even at the tem-

RESULTS OF INVESTIGATION OF EIGHT TYPES OF PORCELAIN INSULATORS

Type	Manufacturing History	Service History	Percentage Quartz	Percentage Feldspar	Black Particles	Percentage Porosity	Appearance of Fracture
1	Slightly underfired.	In service nine years—O.K.	13	28	Number used as standard.	None	Finely granular, non-vitreous.
2	Slightly underfired.	In service nine years, cracked.	Not determined	12 near crack, 19.7 away from crack.	One-half as many as type 1.	None	Finely granular, non-silky luster.
3	Overfired.	Never put into service.	14.1	0	Practically absent.	4.7	Slightly brownish, non-silky luster.
4 Section underfired.	Underfired.	Never put into service.	Not determined.	24.7	Many more than type 1.	None	Slightly brownish, non-silky luster.
5 Section at puncture.	X	In service five years over a substation.	Not determined.	13.25	Fewer than type 1.	None	Finely granular, non-silky.
6 In punctured cap but away from it.	X	In service five years over a substation.	Not determined.	16.4	More than type 1.	0.1	Finely granular, non-silky.
7 In flange of punctured insulator.	X	In service five years on a tower.	Not determined. Not determined.	16.4 and 14.25.	Same as type 1.	None	Finely granular, non-silky.
8 Piece of cement.	X	In service five years over a substation.	Not determined.	.....	None.	High	.....

Before sections were made from the complete insulators their resistance was measured at approximately 1000 volts and then they were punctured. The following table presents the results in a way that affords a rapid comparison:

Insulator No.	Ohms Resistance	Voltage at Breakdown	Discussion of Results
1	62,300	Under 12,000	Cap heated at point of previous failure
2	157,000	12,000	Same as No. 1
3	420,000,000	39,000	No heating of cap
4	204,500,000	50,000	No heating of cap

perature developed during the failure the quartz remained unchanged.

The black particles are very evident in the upper portion of photograph No. 17_o owing to the great contrast which exists. They are well rounded—a condition which goes to show that they have been subjected to a high temperature. The percentage of feldspar in this section is very low, being only 13.25.

Type No. 6 is a section of a cap, but is taken at a point far away from point of breakdown. This section, No. 11, is from the same insulator as the one described in type No. 5. The section is very much clearer and sharper in all the outlines and details than section 17. The black particles are quite prominent in this section, which would indicate a rather low firing temperature. The feldspar percentage is higher than it was in the region immediately surrounding the puncture. In this section it is 16.4. There are several small holes distributed over the section. Even though the number of these holes is small, any possible alignment would materially decrease its resistance powers. The pores are estimated to be about 1 per cent.

Sections Nos. 22 and 23 of type No. 7 were obtained to study the conditions in the flange part of the insulator and to compare the results with section No. 11 of type No. 6.

The most interesting fact of this type is that the percentage of feldspar in section No. 22 is the same as the percentage in section No. 11. Section No. 23, which is nearer the edge of the insulator, has a lower percentage of feldspar. The percentage in this case is 14.25. The black particles in both section No. 22 and section No. 23 are the same in number, distribution and form as in section No. 11. In both types (Nos. 6 and 7) the general appearance of feldspar, quartz and the matrix are also the same.

A section of the cement (type No. 8) was obtained in order to study any crystallization of importance and also to determine the truth of the theory that possible crystallization was one of the important factors in the electrical life of an insulator. Photographs Nos. 18_o and 18_p are views of sections of cement. Zinc silicate is the only silicate that expands on crystallization, and a careful examination of the section failed to reveal the presence of any crystals. The crystals that are visible in photograph No. 18_p are impurities from the limestone or blast furnace slag. They have no significant importance, and their composition was not determined.

While this investigation did not yield all the results that were hoped for, a study of the results shown in the table brings out three very noticeable points.

The first is that the quartz is unaffected by any firing temperature and remains practically constant throughout all the types. If the properties of the quartz are very different from the feldspar its presence may be objectionable as it would cause electrical stresses to be set up in the insulator. It is possible that some high-fusing feldspar could be used in place of the quartz with much better results.

The second notable point is that the porosity of all the sections was very low. Even in the overfired case it was only 4.7 per cent, and in many cases it was 0 per cent.

The third point is that there is an absolute lack of any crystals other than the quartz. This disproves any theory that a crystallization may be the possible cause of the deterioration. There may be a slight decomposition of the feldspar into amorphous sillimanite, but these substances require special work for their detection, and in this investigation they were not looked for.

The percentage of unfluxed feldspar seems to have some relation to the quality of the insulator. Sections of the poorer quality insulators have a low percentage of unfluxed feldspar, while the good insulator sections have almost double the percentage of feldspar. In all cases the history of the specimen was so vague that a satisfactory comparison can not be made, and conclusions can only be general.

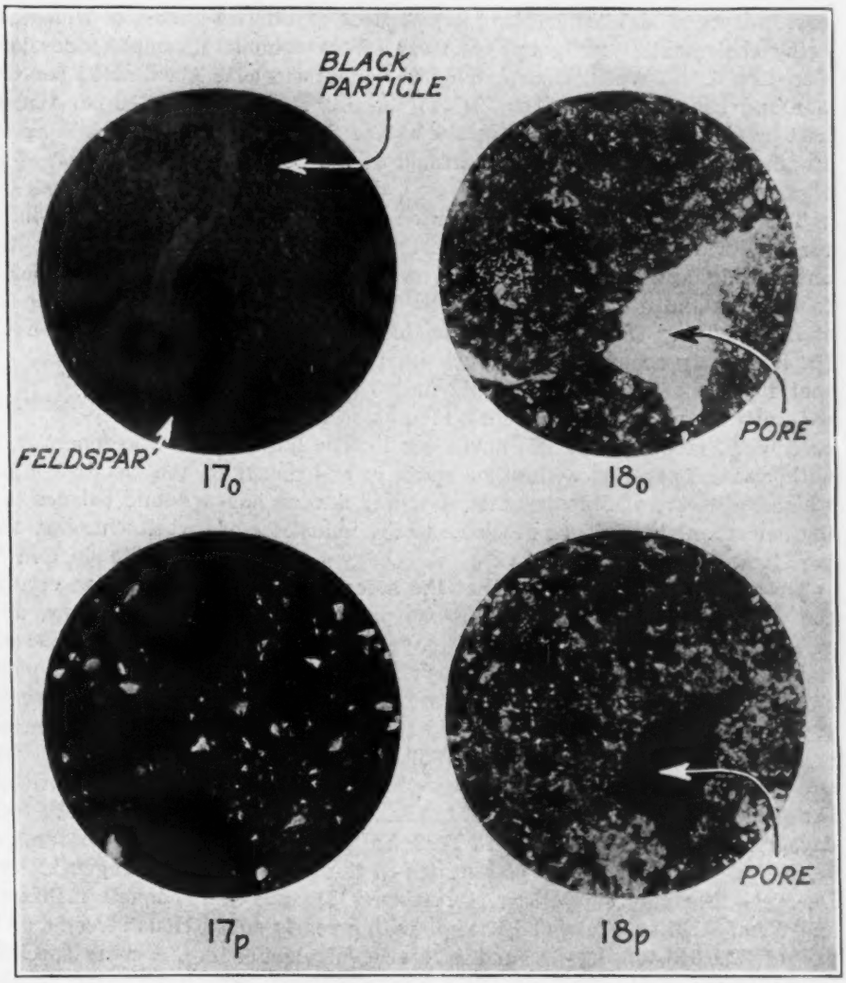


FIG. 3—PHOTOMICROGRAPHS OF INSULATOR SECTIONS REFERRED TO IN FIG. 2 UNDER ORDINARY AND POLARIZED LIGHT (600 DIAMETERS)

Development of Massachusetts' Water Power

Special Commission Appointed to Investigate the Facilities and Possibilities in This Direction Urges Action—Public Ownership Is Declared to Be of Doubtful Value as a Water-Power Policy

DEVELOPMENT of water-power resources and the compulsory coöperative increase of storage facilities under the regulation of the Waterways Board are recommended in a report of the special commission to investigate the water-power facilities and possibilities of Massachusetts, John E. Beck of Chelsea being chairman. Among the members of the commission are A. R. Weed, chairman of the Massachusetts Gas and Electric Light Commission; Charles T. Main, past-president of the American Society of Mechanical Engineers, and John N. Cole, chairman of the Commission on Waterways.

The report has been ordered printed by the Legislature. Its recommendations are embodied in a bill authorizing and encouraging mill owners and others to improve and utilize fully the water resources of the state, providing that after a reasonable lapse of time the state may acquire at cost such improvements, and that in case of the failure of the mill owners to act within three years the state may take steps to develop such water resources for the public good. The bill also authorizes coöperation with other states in and through which the rivers of Massachusetts rise and flow or having power which might be available to the industries of the state.

The commission points out that the actual output of the developed sites on the twenty-one principal rivers of Massachusetts is about 100,000 hp.-yr., with a potential energy equivalent to 333,811 hp.-yr. annually. Based on mean annual run-off and expressed in wheel horsepower at 80 per cent efficiency, the total potential power is estimated at 506,593 hp. Of this 333,811 hp. has been developed, and the aggregate capacity of the waterwheels installed at the developed sites is 325,382 hp. The undeveloped potential power is 172,782 hp. The undeveloped water power at new power sites on the Chicopee, Deerfield, Farmington, Millers, Quinebaug, Shawsheen and Westfield Rivers totals 88,590 hp., with a yearly output of 776,048,400 hp.-hr. and a coal equivalent of 779,513 tons. The unutilized water power at developed sites on the Charles, Concord, Connecticut (44,300 hp., 388,068,000 hp.-hr. or 389,800 tons of coal yearly in Massachusetts for the last), Ipswich, Millers, Neponset and Westfield Rivers totals 55,959 hp., or 490,200,840 hp.-hr. per year, representing a coal equivalent of 492,389 tons.

The total undeveloped power on these fourteen streams represents a coal equivalent of 1,271,902 long tons of coal yearly, or 1,266,249,240 hp.-hr.* On an operating basis of 80 per cent utilization and service twenty-four hours per day for a portion of the power and fifty-four hours a week for the rest, the coal equivalent† is 664,819 long tons per year for both developed and unused power at the developed sites. In sum, with streams capable of developing between one-third and one-half million horsepower and actually deriving the benefit from but one-third of these amounts the people of the state are paying an extra toll for 1,250,000 tons of coal per year, most of which can be saved through a proper and more complete development of the water resources. With coal at $5 per ton, this means $6,250,000 per year, and at $10 per ton, $12,500,000 per year.

"There is an opportunity now with proper legislation to save most of this coal," the report states, "but it requires concerted action by mill owners and the state to bring this about, and the following improvements: (1) The use of improved hydraulic machinery; (2) the use of water power for a longer period of time or with greater pondage created at the different mill sites; (3) the development of sites not formerly utilized; (4) water storage."

COMPLICATIONS OF THE SITUATION

The report points out that it is not possible to carry the installation of waterwheels beyond the point of economic balance between cost and value of return on investment, but the increased cost of coal has made a definite shift in favor of a longer use of stream power. Storage reservoirs cannot do more than partially control the flow, although they are important factors in artificially increasing the run-off of a stream. Many swamps and poor meadows, however, will serve their best use if covered with water. In the case of the Merrimac and Connecticut Rivers the situation is further complicated by lack of jurisdiction due to the fact that the principal headwaters of both rivers are out of the state. Hence it is necessary to make use not only of storage reservoirs but also of larger power installations and longer hours of operation in order that the most complete utilization of the potential energy of the various streams of the state may be secured.

A more specific illustration of the utilization of unused power is given in the case of the Millers River. The source of this power is the storage of eight prospective reservoirs. It is estimated that this stored water, amounting to an average flow of 3,100,000,000 cu.ft. per year, would add to the output of the thirty-one existing plants at their present hours of operation, allowing 20 per cent waste, 8,043,418 hp.-hr., equivalent to 8079 long tons of coal. No allowance was made in this estimate for the initial creation of power at some of the reservoir sites nor for the resulting increase in the power output of the Connecticut River at Turners Falls and Holyoke.

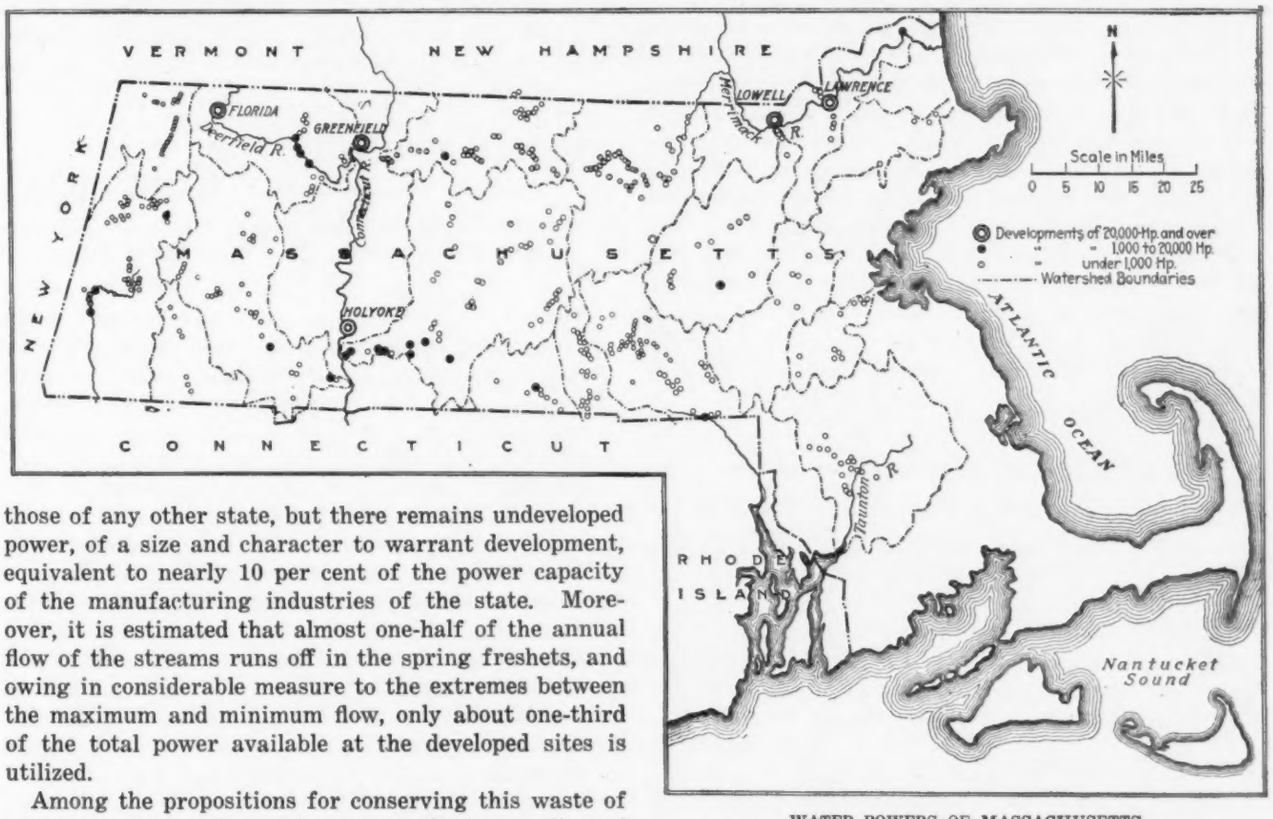
As the law now stands, storage reservoir corporations may be organized and storage created under the general corporation law and the flowage rights of the mill act (Revised Laws, Chap. 196). Mill owners on a stream may unite for this purpose, save in so far as they may be corporations restricted as to holding shares in other

*The horsepower of the sites included in the above total has been obtained by multiplying the mean flow of the stream in cubic feet per second by the fall in feet and dividing the product by 11, which gives the net horsepower on wheels, realizing 80 per cent of the theoretical power.

†At 2.25 lb. per horsepower-hour.

corporations. But if some owners act while others refuse, those refusing will enjoy the advantage of any improvement in stream flow without sharing in the burden of maintaining the necessary storage reservoirs. This can be overcome, the report states, only by legislation authorizing the creation of storage and the levying and collection of tolls for the use of the stored water even against the will of those refusing to share in the undertaking. Such legislation bears a close analogy in principle to provisions, long on the statute books and sustained by the courts, whereby some of the proprietors of lands, wharves or other real estate or of mills or dams held in common may make needed improvements or repair or rebuild the structures at the expense of all the proprietors, including those unwilling to participate.

The water powers of Massachusetts are developed to a higher percentage of the possibilities than perhaps



WATER POWERS OF MASSACHUSETTS

those of any other state, but there remains undeveloped power, of a size and character to warrant development, equivalent to nearly 10 per cent of the power capacity of the manufacturing industries of the state. Moreover, it is estimated that almost one-half of the annual flow of the streams runs off in the spring freshets, and owing in considerable measure to the extremes between the maximum and minimum flow, only about one-third of the total power available at the developed sites is utilized.

Among the propositions for conserving this waste of power are, first and most important, the impounding of freshet waters and their release during uniform periods of drought and scarcity, the redevelopment of existing water-power plants along modern lines for more efcient use of water, and the interchange of power by electrical interconnection so that the wastage of water due to lack of continuous operation of existing power plants may be saved.

The commission points out that storage can only be created by dams located as determined by the topography of the watershed, and it may be impossible to acquire the necessary sites (their value for any other purpose is usually small) unless they can be taken by eminent domain. If there are undeveloped sites on streams below the reservoirs, their value is increased by the stored waters but wasted unless they are developed. If the owners of such undeveloped powers fail in a reasonable time to develop them, this should be done for the common benefit of the owners who have joined together to improve the stream flow, or for the benefit of the public. This again involves the exercise of the right of eminent domain, and both instances require legislative sanction for their accomplishment. Any question of the authority of the Legislature to grant such right of eminent domain has been dispelled by the recent adoption of the constitutional amendment relative to the public interest in natural resources.

Regarding public development and ownership, the report says:

"The vital interest of the public in cheap and reliable power for the industries of the commonwealth is so manifest, and water power is a natural resource so definitely limited in extent, that many thoughtful people have urged that any projects for conserving and utilizing as nearly as practicable the full potential power of the streams should be undertaken by the state. Were the streams unfettered by investments in privately owned mills with experience and knowledge of water-power development as it is to-day, there would be great force in the argument for the acquisition and development of this great natural resource under public ownership, connected by electrical transmission and kept in balance with well-located steam stations, so that the whole might form one great reservoir of power for industries, transportation and general use. But such an ambitious solution involves many complex problems in the necessary readjustments of important industrial interests and an enormous public expenditure, the self-sustaining character of which might not be clearly demonstrable. Furthermore, broadly speaking, if the full workable power of the streams is developed and utilized, it is perhaps a matter of little concern to the public at large whether it is undertaken by public or private enterprise."

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

PROTECTING INCANDESCENT LAMPS ON ARC-LAMP CIRCUITS

Relay Employed to Prevent Current Surges Produced by Sticking of Arc Lamps in Series with Incandescent Lamps

On one street-lighting circuit in a city in the East where incandescent lamps were connected in series with arc lamps as many as twenty incandescent lamps, valued at $2 per unit, burned out each night owing to surges in the current. To remedy this trouble two solenoids were placed in series with the line and arranged with their plungers in the same vertical line so that they would make and break a contact. The opening of the contact connects resistance in series with the incandescent lamps so they will not be damaged by surges. The plunger on the upper solenoid is normally held away from the plunger of the lower one and will drop and make contact only when the surge in the arc curcuit falls below the normal value. The lower plunger will be forced upward to make a contact with the upper plunger when the surge is greater than normal value, thus allowing for protection in either direction.

A BOILER-ROOM BONUS THAT SATISFIES THE MEN

Amount Paid Increases Each Month Up to a Certain Point, but Is Forfeited by Absence or Lateness

The labor situation in the power plant was one of the most serious problems with which the central stations were confronted during the war and is one that may face them for some time. Activities in other departments can be curtailed and in some entirely suspended and still give the public good service, but the production of power must go on or the business of the company and that of many industries dependent on it for power will come to a standstill. The chief difficulty comes in the boiler room, among the firemen, coal passers and ash handlers, who from the nature of their work can readily shift from one plant to another or from one class of work to something else, and this turnover lowers the efficiency and endangers the continuous operation.

To meet this problem the Empire Gas & Electric Company, of Auburn, N. Y., has devised what it terms an attendance bonus, which, while not original in principle, has some unusual features. A premium of 10 cents per day is paid to each man, provided that he is on duty each day of the calendar month and is not late on his shift. That is, on a thirty-day month he would receive an attendance bonus of $3. The second month he receives 11 cents per day, and the pay goes on increasing at this rate until the bonus becomes 20 cents, or $6 per month, after which it remains constant. Should the man be absent a day or be late on duty any day of the month he loses the entire month's bonus and in addition continues at that month's bonus rate during the next month.

This system has been very popular with the men and has practically eliminated the labor turnover. There are men who have reached the maximum rate without the loss of a single day in the successive months it took to attain it.

The system was devised by Lewis C. Reynolds general superintendent of the Empire Gas & Electric Company.

TWENTY-TWO MILES OF OLD CABLE REINSTALLED

Single-Conductor Street-Lighting Cable of Different Types Is Successfully Used After Being Pulled from Ducts

One of the economies which war conditions taught and which will probably become standard practice is the reinstallation of old cable. Within the last year the ELECTRICAL WORLD has described at least two instances in which large quantities of power cable have been reinstalled successfully. Now an example of a similarly successful job on street-lighting cable has come to light. During the war period the electrical department of the Lincoln Park Commission, Chicago, reinstalled 122,806 ft. (37,000 m.), or about 22 miles, of cable of various sorts on its system. Eliminating the credit for cable sold for junk, the value of this replaced cable was $18,913.19. These figures on value were arrived at by taking the price at which the cable was purchased less the depreciation. From this it may be seen that the cost figures are conservative in their relation to present cable values.

The method of procedure was to pull the discarded cable from its ducts and roll it on reels. It was then taken to the storeroom, where all lengths of single-conductor cable were spliced and again rolled on reels. No difficulty was encountered in rolling the splices in single-conductor cable on reels, but this was not attempted with the small amount of four-conductor cable which was handled. In all about 650 joints were made in the old cable. Each joint was made by using a soldered copper sleeve, covered with a thin coating of rubber and about eight layers of "linotape" extending back over the lead. The lead sleeve was then wiped in place and the joint filled and refilled with "Minerallac," after which it was sealed.

When the cable was reinstalled the greater part of it went back into service at the same voltage at which it had previously operated. No extra precautions were taken where splices were pulled into ducts, except to instruct men to exercise ordinary care. Forunately,

the runs as a rule were not long, the longest on the entire park system being 338 ft. (103 m.). Since the cable has been installed there have been a few failures,

DATA ON SALVAGED CABLE REINSTALLED

No. Feet	1915	Total Cost
8,400	No. 6-4 conductor rubber and lead 10,000-volt cable.....	$2,065.00
	1916	
20.296	No. 6 rubber and lead 10,000-volt cable.....	3,145.88
	Electric-fountain junk cable.....	450.00
4,618	No. 6 paper and lead 10,000-volt cable, single-conductor.	369.44
7,881	No. 6-4 conductor rubber and lead 10,000-volt cable.....	3,752.50
	1917	
9.972	No. 6 submarine 17,500-volt single-conductor cable.....	3,972.89
34,817	No. 6 rubber and lead 10,000-volt single-conductor cable	3,343.53
32,544	No. 6 paper and lead 10,000-volt single-conductor cable..	1,568.28
957	No. 6 duplex rubber and lead 600-volt cable.....	106.19
444	Ten pairs telephone cable.....	44.40
	Junk cable.....	1,243.51
713	No. 6-4 conductor rubber and lead 600-volt cable.....	265.20
275	No. 12 duplex rubber and lead 600-volt cable.....	30.25
450	No. 4 standard 600-volt single-conductor cable.....	27.00
510	No. 6-4 conductor rubber and lead 10,000-volt cable	124.00
200	No. 10 duplex rubber and lead 600-volt cable.....	9.00
407	No. 6 stranded rubber-covered single-braid 600-volt cable	26.72
275	No. 6 rubber and lead 600-volt single-conductor cable...	8.25
20	No. 6 600-volt single-conductor cable.....	2.16
27	No. 12 stranded 600-volt rubber-covered single-braid cable	8.50
122,806	.....	$20,362.34

but not many more than might happen with new cable.

The table herewith gives in detail the lengths, types and values of cable which was reinstalled from 1915 to 1917, under the direction of Claude Shepard, electrical engineer for the Lincoln Park Commission.

PORTABLE MACHINES FOR DRYING ELECTRICAL APPARATUS

Motor-Driven Blower Forces Air Through Electric Heater to Remove Moisture from Manholes, Conduits, Wet Generators, Etc

On various occasions it may be necessary to dry out electrical apparatus that has become inoperative owing to moisture penetrating the insulation, and delay will prolong the interruption of service. For such cases it may be convenient to use an outfit like the one which has recently been constructed by the Georgia Railway & Power Company to dry out manholes, conduits and electrical machinery which have become damp. The outfit consists of a motor, a centrifugal blower, an electric heater and control apparatus all mounted on a swivel-wheel truck that can be easily moved from place to place. The equipment is said to have 50 per cent higher rating than any that can be purchased in the open market for like purposes. The main switch that stops and starts the motors also controls the electric heater. Furthermore, a lead-wire safety link is connected in series with the cast-iron heating grids so that the circuit will be opened in case the source of cold-air supply is cut off for any reason. Burning up of the heating unit is thus practically prevented.

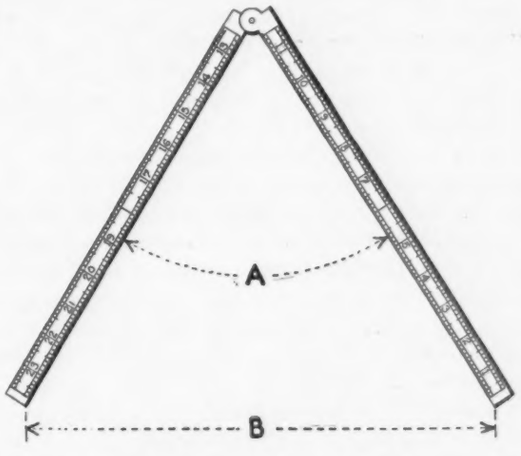
This outfit is intended to supply about 1000 cu.ft. (28 cu.m.) of free air per minute at a maximum temperature of 140 deg. C., which adapts it to be used for drying out large transformers, subway holes or conduits, large generators, etc.

PLOTTING CONDUIT-RUN ANGLES WITH A 2-FT. RULE

Method Which Will Facilitate Bending Conduits So They Will Fit Accurately in Any Given Place

BY TERRELL CROFT

The angle between two lines of conduit can be easily plotted or determined by a 2-ft. rule as follows: To find the angle *A* between the legs of the rule, open the ends so that the edges of the two legs of the rule lie along the center lines under consideration. Then measure the distance *B*. Now refer to the table to find the corresponding angle. For example, if the distance *B* measures 10⅛ in., the angle *A* will then be 50 deg. Conversely, if it is desired to lay out an angle



A	B Inches		A	B Inches	
Degrees	Decimal	Nearest 64th	Degrees	Decimal	Nearest 64th
1	.21	13/64	35	7.20	7 13/64
2	.422	27/64	40	8.21	8 13/64
3	.633	41/64	45	9.20	9 13/64
4	.837	27/32	50	10.12	10 1/8
5	1.04	1 3/64	55	11.08	11 5/64
7.5	1.57	1 37/64	60	12.	12
10	2.09	2 3/32	65	12.89	12 57/64
14.5	3.015	3 1/64	70	13.76	13 49/64
15.	3.12	3 1/8	75	14.61	14 39/64
20	4.17	4 11/64	80	15.43	15 7/16
25	5.21	5 13/64	85	16.21	16 13/64
30	6.21	6 13/64	90	16.97	16 31/32

A SIMPLE METHOD OF ASCERTAINING CONDUIT-RUN ANGLES

of given magnitude, lay the rule with its sides spread apart on the floor, or on a piece of paper, and separate the ends of the legs until the distance *B* corresponds with that given in the table for the angle which it is required to plot. Two 1-ft. scales or rulers may be used, instead of a 2-ft. rule, if their corners are placed together at one end.

To find or plot the angle of a conduit-run offset one leg of the rule can be laid along one side center line and the other leg of the rule laid along the offset center line. If it is desired to find the offset angle, the distance *B* is measured and the corresponding value is found from the table. If it is desired to lay off a certain angle, the legs of the rule are spread apart until the distance *B* is that specified in the table for the angle under consideration.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

WOMEN SUCCEED WELL AS OPERATORS IN ATLANTA

They Can Be Depended Upon in Emergency and Will Be Given Every Opportunity for Advancement

The Georgia Railway & Power Company, Atlanta, Ga., is employing in its substations four women as operators. Though they are under the direction of an experienced man operator in charge of the plant, the women are very frequently left entirely alone at the switchboard. In speaking of the women operators, Superintendent George Iler says:

"We are very proud to announce that some of these operators have learned to do considerable switching. One of the women is able to start machines and place them under load, which is very remarkable considering the short training she has had as compared with the training necessary for young men. These young ladies have not had any accidents or errors of any kind.

"We have also noticed a remarkable improvement in application to duty where the women are working. The women have been in service long enough to demonstrate that they are going to be loyal employees and can be depended upon through any emergency. They are paid the regular scale of wages for this kind of work and will be given every opportunity for advancement."

FAILING SUPPLY OF GAS HELPS OHIO COMPANIES

Applications for Electric Service and for Quotations on House Wiring Increase Fast as Reliability of Gas Service Declines

Electric light and power companies in northern Ohio are enjoying a brisk demand for electric service. Homes are being wired and connected to central-station lines at a rapid rate because the natural-gas service is becoming less reliable. The Sandusky Gas & Electric Company is typical of those utility companies reporting increases in electrical customers. It connected more customers in the month of December, 1918, than in any one previous month in the history of the company, although it had not a single salesman on this work. Moreover, there was no impetus to carry it over into December because during the period of the war the company had discontinued its monthly payment plan under the terms of which it contracted with the customer to turn the work over to the electrical contractor, paying him cash for the work and permitting the customer to pay for his wiring on the installment plan.

All of the present wiring business is being handled by the contractor directly, the central station being entirely out of the retail business. According to E. A. Bechstein, vice-president and general manager of the Sandusky Gas & Electric Company, the principal reason for the number of connections made was the fact that during the past winter natural-gas service was so bad that many homes depending on natural gas for illuminating purposes were in the dark a good part of the time. At the 1918 meeting of the Ohio Electric Light Association at Cedar Point Mr. Bechstein predicted that since natural gas is on the wane all over the State of Ohio many other communities will experience the same demand for electric service which has been already noticed at Sandusky.

CONTINUE TO ASK CUSTOMERS TO FINANCE THEIR EXTENSIONS

Alliance (Ohio) Company Feels Its Situation Is Such that It Must Still Enforce War-Time High-Cost Measures to Prevent Losses

Policies regarding the payment of extension costs which grew out of the high-cost era will be continued in force by the Alliance Gas & Power Company, an Ohio subsidiary of the Doherty interests. Customers will still be asked to pay a part of the cost of making line extensions to serve them. Residence customers will be accepted under the terms of a plan (see ELECTRICAL WORLD for Nov. 2) by which the difference between the 1914 cost and the present cost is charged to them and is rebated as additional customers come on. Power customers will pay for the extension (see ELECTRICAL WORLD for Nov. 9) and will receive rebates equal to one-half the power bill for each month during the first two years.

Naturally the company will find prospective customers ready to remind it that the war is over and that war-time practices should be abandoned. These will be met with the statement that high prices of labor and material still prevail. Moreover, these persons will be shown that under the state laws the company cannot earn on the depreciated value of the property. The law says valuations for rate making "shall be based on reproduction new as of a date certain." If the company were to spend $50,000 in the next five years for line extensions and declining values should cause this to depreciate to $35,000, and in eight years the company were to come up for a valuation in connection with rates, it would lose the $15,000 of depreciated value. Therefore customers who want service must make up this probable depreciation to protect the company against loss.

No trouble is anticipated in getting customers to understand this situation. It is more advantageous for power customers to accept it than to put in a new plant, because they do eventually get their money back from the power company, but they could never get it back from an isolated plant.

RESUMPTION OF DEMAND FOR OUTSIDE LIGHTING

Reading Utility Reports Outlook for Business Encouraging, While Current Business Shows Healthy Growth

The Metropolitan Edison Company, Reading, Pa., reports a most encouraging outlook for new business, especially among merchants who are increasing their lighting facilities. There is a general resumption of the demand for more elaborate outside lighting fixtures, several important installations of this kind having been made during the past month. Electrical contractors are advocating and pushing semi-indirect store-lighting units to replace older systems of installation.

Business for the past month has shown a healthy growth considering the long period of federal restrictions during which no stimulation of any kind on the part of the company was permitted.

COMMONWEALTH EDISON SELLS $1,000,000 MERCHANDISE IN 1918

Retail Sales Show an Increase of 37 per Cent for the Year—Branch Stores Greatest Gainers—Fixtures to Be Sold—The Outlook

Following the close of the very successful year just past E. A. Edkins, general manager of the electric shops of the Commonwealth Edison Company, Chicago, prepared a general summary of the accomplishments. Some of the points prominent in this statement follow:

During the four years since the Edison Building Electric Shop was opened gross sales have been quadrupled. During the calendar year 1918 they exceeded $1,000,000, not including the sales made through the wholesale merchandising department. The increase in gross sales for 1918 over 1917 amounted to 37 per cent.

During the last year the shops have also taken over an additional 6000 sq.ft. of space, which is now known as the appliance section of the electric shop, the old quarters having been assigned exclusively to the supplies and portable lamp section. The section formerly known as the annex is now being remodeled and will shortly be opened as a high-class fixture display and salesroom.

The federal coupon redemptions during 1918 have increased very rapidly. The distribution or coupon certificates through the medium of our monthly bills and from the cashiers' windows on the second floor have enabled us to build up an average attendance of four to five thousand prospective buyers per day.

The development of branch electric shops' business has been equally gratifying, the four outlying stores showing an average increase in 1918 over 1917 of 75 per cent in their gross business.

One of the outstanding developments in 1918 was the opening of numerous lamp-renewal substations in various sections of the city in order to afford customers convenient locations for the exchange of lamps. In some of these lamp-renewal branch bureaus we have been permitted by the lamp department to install a small display of electrical appliances, and these displays have stimulated the sale of appliances in their respective neighborhoods. It is, therefore, quite possible that a few branch shops may be opened in such sections of the city as seem to be in need of this additional service.

Another feature of the year was the campaign on washing machines, which resulted in the sale of over 1500 washers during the year.

Mr. Edkins sets the mark for 1919 at $1,500,000, a 50 per cent increase over the 1918 achievement.

LINE EXTENSIONS ARE NOW FINANCED ON PRE-WAR BASIS

When Cost Is Less than $100 Providence Electric Company Makes Extensions Free of Cost to Customer

The Narragansett Electric Lighting Company, Providence, R. I., has discontinued the financing of extensions on a war basis, and henceforth customers requiring extensions costing less than $100 each will be furnished with line facilities at the expense of the company. The Rhode Island Public Utilities Commission has approved the change. During the war the company required all customers whose service necessitated extensions costing less than $50 each to pay the excess cost of such construction above the normal cost estimated on the 1914 basis. Extensions costing more than $50 each had to be entirely financed by customers. The company refunded the normal cost annually to the customer paying the excess cost, the refund being at the rate of $20 for every $100 paid to the company for energy used by the consumer at the particular location. The company also paid 6 per cent interest on any unrefunded balance of the normal cost, reserving the right to refund at any time all or any portion of the unrefunded portion of the normal cost.

INCREASED POWER RATES SHOW LITTLE EFFECT ON EARNINGS

It Is Deemed Best by the Detroit Edison Company that Schedules Should Lag a Little in Their Adjustment to the Times

Certain increases of electrical power rates were made by the Detroit Edison Company in the past year, but with little effect on its earnings, Alex Dow, president of the company, states in his annual report for 1918. The first increase was an advance of one-tenth of a cent (gross) per kilowatt-hour, made in November, 1917, in the contract rate for large blocks of untransformed high-pressure energy, which is the company's wholesale industrial power rate. In April, 1918, a further increase of a like amount was made. Mr. Dow says:

The cost of fuel is a larger proportion in the total cost of electric power service, which is in use many hours per day, than it is in electric lighting, which is in use daily for only a few hours. It is an especially large proportion in the cost of large blocks of untransformed energy, for which class of service our labor and investment expenses are by comparison small. Therefore it was in that class that the first correction of rates had to be made. In July the contract rate for low-pressure electric power service was increased one-half of a cent (gross) per kilowatt-hour. Neither of these power-rate increases became widely effective during the year, because our power contracts have been made for three-year terms, and a newly filed rate is applicable only to new contracts or to renewals of old contracts.

Electric light rates are unchanged excepting for a rearrangement and reduction of prompt payment discounts on the larger bills ($50 per month and upward), which made our discount practice uniform for all classes of service but made only a minor addition to earnings. The great majority of all our customers thus continue to be served at rates which were established in 1915 and were based upon the costs of 1914 and earlier years.

Had the war continued, we should have had to propose increases of rates for all classes of service. As it is, we cannot say that the rates for electric supply as they stand are adequate for the conditions as they stand or as they are likely to be in the near future.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Alternating-Current Generator Wave Form.—F. D. NEWBURY and S. L. HENDERSON.—The form of the voltage wave of an alternating-current generator is determined mainly by the arrangement and connection of the armature winding, by the distribution of flux in the air gap, and finally by the shape and relative value of the armature reaction. The first two factors determine the wave form at no load, and the third determines the change in wave form caused by the load current. The influence of these factors is discussed in detail in this article.—*Electric Journal,* November, 1918.

Transformer Losses.—V. E. JOHNSON.—Gives tests for condition, internal losses and distribution losses.—*Power Plant Engineering,* Jan. 1, 1919.

Electric Arc Welding in Tank Construction.—R. E. WAGNER.—The adequacy of electric welding, both with metallic and carbon electrodes, in manufacturing processes involving the fabrication of sheet metal, up to heavy boiler plate, needs no better demonstration than that afforded by the Pittsfield Works of the General Electric Company in the construction of many thousands of transformer tanks. Electric welding for this work has almost entirely replaced riveting, effecting a better construction, lower cost of manufacture and a material reduction in the amount of noise and confusion in the tank shop. The author outlines the qualifications of a successful operator, and another very important point that is considered in detail is the intelligent study of the work in hand and its preparation for welding. Any neglect of either of these factors is certain to result in unsatisfactory work. The illustrations afford an idea of the extensive application of arc welding to tank construction, while the tables contain data that will be of assistance in determining the cost of the process.—*General Electric Review,* December, 1918.

Butt Welding of Some Non-Ferrous Metals.—E. F. COLLINS and W. JACOBS.—The process described in this article was the outcome of a search for a satisfactory method of connecting the end rings of the rotor bars of induction motors. One of the first methods employed consisted in bolting the end of the rotor bars to the copper end rings, using lock washers to secure the connection. The high resistance of this joint, which was increased by oxidation as the result of heating, raised the temperature to a point where the temper of the lock washer was destroyed and the connection loosened to a serious degree. The next method was to solder the end rings to the conductors, but poor electrical contact again caused heating and melting of the solder, and the engineers were compelled to look further for a solution of the problem. Electric butt welding gives a perfect electrical joint and admirably fulfills all the requirements; in fact, cases have occurred in practice where the solid copper end ring has melted, leaving the welded joints intact.—*General Electric Review,* December, 1918.

Generation, Transmission and Distribution

Waste Wood as a Fuel Possibility.—O. F. STAFFORD.—The use of sawdust and wood ends as a fuel offers the double advantage of utilizing waste products and of a renewable supply. The conversion of wood waste into ethyl alcohol, food for animals, direct fuel and a powdered charcoal which might be used directly in a specially designed Diesel engine is here suggested as practiced by the head of the chemistry department of the University of Oregon.—*Journal of Electricity,* Dec. 15, 1918.

Inspection and Test of Electric Transmission Lines.—O. C. CALLOW.—Including a discussion of the troubles and losses in overhead transmission and also tests and remedies to get the best efficiency.—*Power Plant Engineering,* Jan. 1, 1919.

Saving the Waste in Penstock Pipe Design.—B. F. JAKOBSEN.—The author treats of the economical use of materials in the design of penstocks for hydroelectric systems.—*Journal of Electricity,* Dec. 1, 1918.

Turbine Operation.—J. WILSON.—Gives methods of inspection and a discussion of operating conditions and checks on operation performance.—*Power Plant Engineering,* Jan. 1, 1919.

Design and Selection of Oil Circuit Breakers.—J. N. MAHONEY.—The author points out why the oil circuit breaker is used in power systems of large capacity. The rating of these switches is discussed, and the effects of the line constant together with auxiliary devices such as automatic voltage regulators are shown.—*Electric Journal,* November, 1918.

Design of Porcelain Insulators from the Theoretical Standpoint.—G. I. GILCHRIST and T. A. KLINEFELTER.—From a theoretical standpoint a conception was formed of the functions which air and solid dielectrics perform when used in combination for insulating purposes. Based on this conception, a large number of tests have been made under commercial conditions which show that it is possible to use air more efficiently than has been customary in the past. Breakdowns of an air path over a surface have been obtained which average as high as 9.4 kv. per centimeter effective value (23,900 volts per inch), over a distance of 17 cm. (6.7 in.). The conditions of design are such that these same averages may be maintained at any voltage by increasing all dimensions of the structure proportionately. The principal thing to be considered is the proper shaping of the terminals in order that points of high intensity may be eliminated and a high average intensity obtained.—*Electric Journal,* November, 1918.

Traction

Electric Freight Haulage Is an Economic Duty.—A. B. COLE.—It is said that such service is invaluable to the city and country as well. The field is practically unlimited and the service can be developed by making a traffic analysis, providing the proper equipment and using farsightedness and imagination.—*Electric Railway Journal,* Jan. 4, 1919.

Modern Track Needs Good Ballast.—R. C. CRAM.—The author shows why a well-ballasted track is economical to maintain. He describes types of construction, gives the properties and materials necessary for an ideal ballast and discusses ballasting from the standpoint of the best engineering practice.—*Electric Railway Journal,* Dec. 21, 1918.

Installations, Systems and Appliances

Constant-Energy Arc-Welding Set.—P. O. NOBLE.—The author describes a new and ingenious type of arc-welding equipment which combines those characteristics best to perform certain kinds of welding. The success of electric arc welding is largely dependent upon the skill of the operator. The control of the location of the crater can best be effected by the use of a short arc, and the advantage of the system described lies in the fact that it facilitates the maintenance of a short arc and makes it difficult to continue a long one.—*General Electric Review,* December, 1918.

Electric Winding Engines and Mine Hoists.—H. H. BROUGHTON.—In this article of the series the author deals with the spiro-cylindrical drum. After considering the influence of drum profile on performance, and noting briefly the great advantage often obtained by the use of spiro-cylindrical drums, an example is fully worked out for balanced operation.—London *Electrician,* Nov. 1, 1918.

Electrically Driven 38-In. Reversing Cogging Mill.—The mill described is one recently installed in the Cleveland district, designed to roll 3-ton steel ingots 18-in. by 22-in. (46-cm. by 56-cm.) to 4-in. by 4-in. (10-cm. by 10-cm.) billets. The apparatus consists principally of a 4800-hp. motor, three generators, each of 1500-kw. capacity, and an induction motor of 2700 hp.—London *Engineer,* Dec. 13, 1918.

Overhauling and Testing Fans.—M. S. LEONARD.—In this paper are described the detection of leaks and reasons for poor performance of fans.—*Power Plant Engineering,* Jan. 1, 1919.

Adequacy of Welding in Constructing Hulls of Ships.—H. M. HOBART.—Although electric arc welding has been employed for years in many industries, very little of practical value has been written about the process and almost no data were available from which deductions could be drawn to determine the suitability of the process for specific applications. It remained for the exigencies of the war to bring about the pooling of all available information and the collaboration of competing interests to advance the art. The progress has been largely accelerated by the welding committee of the Emergency Fleet Corporation, and it has been the duty of the research sub-committee of the welding committee to determine the relative merits of the many different systems and equipments. The present attitude of the welding research committee is that, although carefully planned research work will undoubtedly lead to further improvements, there are no outstanding technical questions requiring solution in order to proceed at once with the construction of welded ships.—*General Electric Review,* December, 1918.

Applications of Electricity in Ships and Shipbuilding.—J. F. NIELSON.—This article includes a summary of the uses to which electricity has been put in the construction of ships. The author discusses the advantages of using electricity in lifting machinery, in the welding processes of ship construction, the application of electricity to ship propulsion, the advantages of electrically operated steering gear and the use of wireless telegraphy and electric drive for the gyro-compass.—London *Electrician,* Nov. 22, 1918.

Muscle Shoals Nitrate Plant.—ANDREW M. FAIRLIE.—Description of the largest synthetic nitrogen works in the world giving important processes for the fixation of atmospheric nitrogen. The cyanamide and other chemical processes are also given.—*Chemical and Metallurgical Engineering,* Jan. 1, 1919.

Impurities in Boiler Water.—F. F. VATER.—The writer names the impurities as they occur in boiler water, giving characteristics and methods of testing and treating feed water.—*Power Plant Engineering,* Jan. 1, 1919.

Electrophysics and Magnetism

Eye Protection in Iron-Welding Operations.—W. S. ANDREWS.—In welding operations three kinds of radiations must be guarded against, one or all of which may be present to an injurious degree. The problem is to provide a perfectly safe filter that will permit of the greatest degree of visibility and at the same time will exclude the infra-red or heat rays and the ultra-violet rays. Ordinary glass lenses are usually sufficient protection against the latter radiations, but to shield the operator against the heat rays glass of special color or combinations of colors is required. The author shows the spectra of a number of commercial available glasses and combinations of these glasses, and a glance at these charts will show what arrangements of filter will provide the best protection against the radiations of the welding arc.—*General Electric Review,* December, 1918.

Research in Spot Welding of Heavy Plates.—W. L. MERRILL.—The author's record of experiments points to a new and enlarged field for the application of electric spot welding. That the process will eventually supersede riveting to a large extent in all structural iron work is more than probable. With properly designed apparatus and appliances the possibilities of spot welding in the various metal trades are almost unlimited.—*General Electric Review,* December, 1918.

Electrochemistry and Batteries

Undamped Currents in "Super-Conductors."—It is stated that Professor Kammerleigh Onnes has contrived to produce what he terms a "super-conductor"—that is, a conductor without appreciable resistance—by the application of extremely low temperatures. Granted the possibility of such a conductor, one must also assume the possibility of maintaining a continuous current without an appreciable emf. From purely theoretical considerations it has been deduced that the specific

resistance of mercury at 4.25 deg. absolute would still be measurable but at 2 deg. absolute would become negligible. Experiment, however, elicited the interesting result that when the temperature was reduced to a certain point, viz., 4.19 absolute, the resistance fell suddenly to an almost immeasurable value. This marks the transition from conditions of normal conductivity to "superconductivity." Once the temperature fell below this critical point it was found possible to pass a current at a density of 1000 amp. per square millimeter through a conductor 1 m. long without any appreciable difference of potential between the ends.—London *Electrician*, Nov. 15, 1918.

Balancing and Suspending the Movable Coil of a Marine Dead-Beat Galvanometer.—J. RYMER JONES.—The improvements here described consist of the means provided for balancing the coil, in the method of attaching the suspending wires, by substituting rubbing and self-cleaning instead of the vertically pressing contacts usually employed, and also in the manner of safeguarding the coil by keeping it in a practically central position between the magnetic poles while the suspension slide is being put into or removed from the instrument.—London *Electrical Review*, Dec. 6, 1918.

Units, Measurements and Instruments

New Standard of Current and Potential.—CHESTER T. ALLCUTT.—The serious shortage of standard cells caused by the war has emphasized the need for a substitute for the standard cell used in connection with potentiometers. The new standard proposed as a substitute in a certain class of direct-current measurements is essenially a Wheatstone bridge which will balance for but one value of current.—London *Electrician*, Dec. 13, 1918.

Testing Direct-Current Watt-Hour Meters.—P. B. FINDLEY.—A description is given of one type of direct-current watt-hour meter, then the methods of testing such instruments are described and problems worked out showing their practical application.—*Power*, Dec. 31, 1918.

Telegraphy, Telephony and Signals

Radio-Telephony in Japan.—E. YOKOYAMA.—After outlining the experiments in radio-telephony carried out in Japan since 1906, the "T. Y. K." system is cited. A new system using, in the most favorable case, copper and aluminum electrodes about 0.2 in. (0.5 mm.) apart in rarefied air or other gas at a pressure of about 40 mm. to 70 mm. as the discharger is then described in great detail. The influence of electrode design, gas pressure, electrode material and other factors is considered. Means of securing steady and continued operation are given.—*Science Abstracts, Section B*, October, 1918. (Abstracted from *Proceedings* Inst. Radio Eng., June, 1918.)

Capacity of a Horizontal Antenna.—J. B. POMEY.—A short article establishing the Pederson formula relating to the capacity of a horizontal antenna.—*Revue Générale de l'Electricité*, Nov. 23, 1918.

High-Frequency Alternators.—O. BILLIEUX.—The requirements of wireless telegraphy have forced constructors to seek to produce directly alternating current at high frequency by means of special alternators. The author describes the principles of certain of these devices, and in particular those of Marius Latour, Alexanderson and the Société Française Radio-électrique, the last-named being manufactured by the Société Alsacienne de Constructions Mécaniques.—*Revue Générale de l'Electricité*, Nov. 23, 1918.

Miscellaneous

Engineering Educators' Opinions.—The paper consists of the answers of a number of the leading directors of enginering education in the various universities to a questionnaire sent out to determine what effect the war has had on engineering educational policies with particular reference to the operation of the Students' Army Training Corps. The consensus of opinion seems to be that the S. A. T. C. was so short-lived that it will have little effect on enginering education. It is generally believed, however, that one permanent effect of the war experience will be to stimulate engineering education—*Engineering News-Record*, Jan. 2, 1919.

Water-Power Situation on the Pacific Coast.—MAJOR GEORGE F. SEVER.—The power shortage experienced in the West was not wholly a product of the war, except as natural expansion was in some part crippled by the restrictions imposed. One of the vital parts of the period, therefore, is to be the extension of power development to meet the new industries and agricultural growth. A survey of such projects now in progress in California and others which await development is made by Major Sever.—*Journal of Electricity*, Jan. 1, 1919.

Development of the Vacuum Valve.—The vacuum valve not only is the factor which has made possible the wireless telephone used on aëroplanes, of which so much has recently been said, but it is also associated with many other modern developments in wireless telephony and telegraphy. The manufacturer of this remarkable device as carried out in a San Francisco factory is given in this article.—*Journal of Electricity*, Jan. 1, 1919.

First Electrically Welded Boat.—JOHN LISTON.—A great deal has been published in the technical press about the electrically welded cross-Channel barge recently built in England and now in service. It will be a source of much satisfaction to American engineers, however, to learn that the first electrically welded boat was built three years ago at Ashtabula, Ohio. In view of the meager amount of information on the subject of electric welding that was then available, the employment of the process in the construction of this boat was epoch-making, and that the work was well done and the process is peculiarly adapted to shipbuilding are evidenced by the service record of the boat. It has been put to unusually severe duties and is still in use on the lakes.—*General Electric Review*, December, 1918.

State Electricity—Article telling what has been done and is in process of accomplishment in Germany, Austria and the Scandinavian countries to insure a sufficient supply of electrical energy for industry.—*Engineering*, Nov. 15, 1918.

Theft of Energy.—H. A. HESLIP.—The writer discusses the various forms of energy theft and their detection. Some means for preventing theft are also given.—*Central Station*, December, 1918.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

INCREASED DEMAND FOR ENGINEERING EDUCATION

Registration at Massachusetts Institute of Technology Is Rapidly Approaching Limit of Facilities Available—More Students Expected

The achievements of the engineer in the war have led to a great increase in the demand for a technical education, and the registration at the Massachusetts Institute of Technology, Cambridge, is rapidly approaching the point of saturation with respect to the available facilities. The institute has more regular students than it has ever had before at this season of the year and only a dozen less than the maximum registration at any time in its history.

Despite the fact that practically all the members of the class of 1919, by means of intensive courses through two summers, received their degrees and offered their services to the country before the armistice was declared. nineteen hundred and forty-four students are now registered. The institute is confronted with the alternative of limiting the registration or providing immediately for additions to the existing buildings. It is expected that the registration next fall will reach 2500 and that 3000 will soon be attained. The capacity of the school as at present equipped is about 2000. Fifty-five per cent of the known living alumni of the institute were in military service or in war industries, and at one time the institute, in response to the demands of the government, was caring for seven or eight different training schools. The demobilization of the military forces is constantly tending to increase registrations.

HIGH WATER CAUSES TROUBLE IN PUGET SOUND DISTRICT

Unprecedented Rainfalls Lead to Line Difficulties and Large Municipal Plants of Tacoma and Seattle Are Forced to Shut Down

Continued high water caused by unprecedented rainfall in the Puget Sound district has worked havoc with light and power lines and resulted in scores of small slides, tying up interurban traffic and in many cases railway service. The three-million-dollar power plant of the city of Tacoma at La Grande has been put out of commission by high water, and the city is buying its electric light and power from the Puget Sound Traction, Light & Power Company. The amount of damage will not be known until the water has receded.

The municipal lighting plant operated by the city of Seattle was completely shut down on Jan. 25 because of the breaking of 600 ft. (183 m.) of wooden-stave pipe by a landslide. The load is being carried by the Lake Union steam plant. The slide occurred about halfway between the concrete dam and the power house. Both pipes carrying water to the turbines, one 6 ft. (1.8 m.) and the other 4 ft. (1.2 m.) in diameter, were carried away. Two pile drivers were immediately hurried to the scene by Superintendent L. B. Youngs of the Water Department, who is also acting superintendent of light during the illness of Superintendent J. D. Ross. It is expected that the work will be completed within a week or ten days. Superintendent Youngs states that the accident was caused by a washing away of the earth under the pipes, causing them to break and fall into the canyon.

COST OF THE MUSCLE SHOALS NITRATE PLANT

Estimated on Feb. 23, 1918, According to Assistant Secretary of War Crowell, at $14,000,000—Other Data Given to Congress

Data given by Benedict Crowell, Assistant Secretary of War, to Congressman Nicholas Longworth and presented before the House of Representatives, show that the estimated cost of the Muscle Shoals nitrate project in October, 1917, was $14,534,000, based upon then prevailing wages and material prices. On Feb. 23, 1918, because of lowering cost of cement to the government, the estimate was reduced to $14,000,000. Other facts given by Mr. Crowell follow:

This estimate includes the dam locks, the flowage rights and the power house with hydroelectric machinery capable of generating about 120,000 hp. The power-house substructure will be constructed so as to provide for placing additional units in the future, if desired, in order to utilize the non-continuous or secondary power in connection with steam generating units already installed at nitrate plant No. 2.

If the amount available from the appropriation of Section 124 of the national defense act should prove insufficient to complete the project, it will be supplemented by reimbursing the appropriation for expenditures already made from that fund which might, with equal propriety, have been made from other funds at the disposal of the bureau. Such reimbursement will be deferred until the necessity therefor actually arises.

It is estimated that about three years will be required for the completion of the project.

Of the power to be furnished by the project, it is estimated that approximately 72,000 hp. will be continuous throughout the year. In all but the dryest years it is to be expected that approximately 100,000 hp. can be developed continuously.

The most economical development of power at Dam No. 2 requires the ultimate installation of generating capacity largely in excess of the requirements of Nitrates Plants Nos. 1 and 2, in order that advantage may be take of the large amount of secondary power available at the dam. It is probable, however, that the initial installation will not be greater than required for the operation of the nitrate plants and that no surplus power will be available for use by other plants.

SECRETARY LANE'S PROPOSAL FOR POWER RESOURCE SURVEY

Presentation of Conditions by Head of Interior Department on Which He Bases Request for Appropriation for Study by Government Bureaus

Secretary Lane of the Interior Department has sent to Congress requests for two appropriations for special investigations and reports on the power supply. One of these is a request for an appropriation of $50,000 for a survey of the power resources all over the United States. This proposed appropriation is embodied in the sundry civil bill, hearings on which are now being held before the sub-committee of the House committee on appropriations. If approved, the work would be done by the Geological Survey. The other request, mentioned in last week's issue of the ELECTRICAL WORLD, is for an appropriation of $200,000 for a report on the power supply for the industrial region of the northern Atlantic seaboard, extending in general from Boston to Washington. If approved, this work would be done by the Geological Survey and the Bureau of Mines in coöperation. The request for the appropriation of $200,000 has been approved by the Secretary of the Treasury and has been forwarded to Swagar Sherley, chairman of the House committee on appropriations.

In a letter to Mr. Sherley explaining the necessity for the appropriation Secretary Lane says:

I am to-day sending to the Secretary of the Treasury a supplemental estimate of an appropriation of $200,000 to be expended in the fiscal year 1920 for a special investigation and report on the power supply for the industrial region of the north Atlantic seaboard, extending in general from Boston to Washington.

I respectfully urge that your committee consider this estimate favorably because I believe the investigation will form the basis for a constructive national policy of the highest economic and industrial significance. The country is now passing through a period of transition which, I firmly believe, will soon be followed by one of industrial activity and expansion. The enormous development of war industries had created an almost insatiable demand for power, a demand that was overreaching the available supply with such rapidity that had hostilities continued it is certain that we should now be facing an extreme power shortage. Happily such a crisis was averted by the signing of the armistice, and the ensuing curtailment in the demand for war materials has carried us past immediate danger of a power famine in the industrial districts for the Northeast.

This subsidence in the demand for power will, I think, not be long continued. In a few months, and especially in the regions mentioned, I anticipate a greatly increased demand for energy, for which present facilities are inadequate. This demand will follow the resumption of industry under the operation of normal economic laws and in the face of international competition, factors that have been largely inoperative during the war. If the country is to reap the full benefit of this returning wave of activity it must be prepared to furnish industry and transportation with an adequate, dependable and economical power supply. Only by increased economy in the production and distribution of power will it be possible for our manufacturers to decrease their production expenses and compete successfully in the world's markets, maintaining at the same time the American standard of wages and living.

That there is opportunity for a system of power supply far more economical and efficient than that now existing in the areas under discussion cannot be doubted. It has for its central idea the development of a plan for the generation and distribution of power on a scale far more comprehensive than now exists in this territory and the more efficient use of the power in industry and in transportation.

This result will be accomplished through the interconnection of existing power centers by means of a trunk-line transmission system of high efficiency. Into this trunk line energy will be fed from hydroelectric plants and steam power stations located at tidewater and near the coal mines. From it will be taken the power required for each principal industrial center and for the electrification of trunk-line railroads and of such branch lines as may be located in metropolitan districts.

Such a comprehensive system of power supply, making use as it would of unutilized or undeveloped water power and of fuel now wasted at the mines, will result in large savings in coal. A very large amount of coal now consumed by steam-power plants can be replaced by the development of water power. Fuel power can be developed near the mines and the wasteful transportation of coal by railroad to that extent avoided. I am reliably informed that as a conservative estimate 50 per cent of the fuel now used by the railroads in this territory can be saved through the operation of trains by electricity instead of by steam locomotives, because of the much higher efficiency that can be obtained in the economical central station in comparison with the wasteful steam locomotive.

The transmission of this energy as electricity instead of the hauling of coal by rail will relieve the railroads of this territory of an enormous freight burden, thereby making available transportation for the hauling of other commodities. This is a matter of far-reaching importance. Not only would the railroads in the immediate territory be relieved of hauling the coal for their own locomotives but other railroads supplying them with coal would be relieved proportionately. This easing of the present strain on trackage and equipment would result automatically in an increase in transportation facilities, the necessity for which the country is now facing.

Such a comprehensive system of power supply will give opportunity for the more continuous use of existing power plants through the operation of the diversity factor; that is, power for which there is no demand at a certain time in one locality can be transmitted to another locality needing power at the moment. Spare units in one power center can then be used to assist other power centers in case of emergency or breakdown. A large amount of spare capacity can thus be brought into service and the capital already invested in existing power stations thus made more productive.

That such economies and efficiencies can readily be obtained has been amply demonstrated by the repeated application of these principles to local situations. It is my conviction that they can be applied regionally with even greater success. My purpose in asking for the appropriation is to make possible the investigation necessary to their practical application in this particular region. The report to follow would present a definite plan for development and estimate accurately the savings to be effected.

I am urging the earliest possible action, because I believe such a plan should be formulated at once before we enter upon a new period of industrial activity, so that the new construction that will be required may be coördinated with such a plan and developments that will not harmonize with the plan may be avoided.

This appropriation is requested not as a substitute for but as supplemental to the other estimate submitted by this department for the investigation of fuel and power problems covering the whole United States. Fundamental studies dealing with principles of power supply and fuel utilization are prerequisite to more intensive investigation of the kind that I am bringing to your attention in this letter.

The wording of the estimate for the proposed $50,000 requested by Secretary Lane is as follows: "General Expenses, Geological Survey.—For a survey of power production and distribution in the United States, including the investigation of methods for the further utilization of water power, and the preparation of reports thereon, one-fourth to be immediately available (submitted), $50,000."

MIDWINTER CONVENTION PROGRAM OF THE A. I. E. E.

Seventh Midwinter Meeting, to Be Held on Feb. 19-21, in New York, Will Provide Discussion on a Number of Topics

The seventh annual midwinter convention of the American Institute of Electrical Engineers will be held on Feb. 19-21, in the Engineering Societies Building, New York.

The convention will open Wednesday afternoon in joint session with the American Institute of Mining Engineers, at which a symposium on "Electric Welding" will be presented. Members of the American Society of Mechanical Engineers are cordially invited to participate in this session. Wednesday evening will be devoted to a lecture by Dr. John A. Brashear on "An Evening with the New Astronomy," which will be followed by an exhibition of technical moving pictures as adopted by the United States War Department for the instruction of the army in the operation of various mechanical devices. Ladies will be welcome at this session.

On Thursday morning there will be a technical session, opened by an address by President C. A. Adams, followed by the presentation of papers by Dr. C. P. Steinmetz and Harold S. Osborne. Thursday afternoon will be devoted to a technical excursion to the Brooklyn Navy Yard, by courtesy of the Navy Department. Opportunities to visit the prominent electrical plants in New York and vicinity during the time of the convention have also been provided. On Thursday evening there will be a dinner-dance at the Hotel Astor for members and guests in attendance at the convention.

Friday morning's technical session will be under the auspices of the electrophysics committee. On Friday afternoon the final session of the convention will be held under the auspices of the telegraphy and telephony committee.

The program of the convention follows:

Wednesday, Feb. 19, Auditorium, 2:30 p.m.

Joint Technical Session.—"Microstructure of Iron Deposited by Electric Arc Welding," by G. F. Comstock (A. I. M. E.); "Path of Rupture in Steel Fusion Welds," by S. W. Miller (A. I. M. E.); "Welding Mild Steel," by H. M. Hobart (A. I. M. E.); "Electric Welding in Shipbuilding," by S. V. Goodall (A. I. E. E.); "Fusion in Arc Welding," by O. H. Eschholz (A. I. E. E.).

Wednesday, Feb. 19, Auditorium, 8:15 p.m.

"An Evening with the New Astronomy," by Dr. John A. Brashear; technical moving pictures showing various mechanisms in operation.

Thursday, Feb. 20, Assembly Room No. 1, 10:30 a.m.

Technical Session.—Address by President C. A. Adams; "The General Equation of the Electric Circuit—III," by Dr. C. P. Steinmetz; review of work of sub-committee of the standards committee, on wave-shape standards, by H. S. Osborne.

Thursday Afternoon, Feb. 20

Technical Excursion.—Visit to Brooklyn Navy Yard.

Thursday, Feb. 20, Hotel Astor, 7 p.m.

Dinner-dance.

Friday, Feb. 21, Assembly Room No. 1, 10:30 a.m.

Technical Session.—"Ionization of Occluded Gases in High-Tension Insulation," by G. B. Shanklin and J. J. Matson; "The Dielectric Strength of Air Films Entrapped in Solid Insulation," by F. Dubsky; "Abnormal Voltages in Transformers," by L. F. Blume and A. J. Boyajian.

Friday, Feb. 21, Assembly Room No. 1, 2:30 p.m.

Technical Session.—"Aëro Telephony," by E. B. Craft and E. H. Colpitts; "Theory of Transient Oscillations," by John R. Carson; "Telephone Circuits with Zero Mutual Induction," by W. W. Crawford (deceased).

Inspection trips may be made to the New York Edison Company plants, United Electric Light & Power Company plants, Interborough Rapid Transit Company plants, the Electrical Testing Laboratories and the laboratories of the Bell System.

MEETING OF CONFEREES ON WATER-POWER BILL

Brief Meeting Held by Senate and House Members in Washington—Protests Against the Inaction of Congress

One brief meeting of the conferees on the water-power bill representing the Senate and the House of Representatives had been held in Washington in the past week up to the time this dispatch to the ELECTRICAL WORLD was filed. At that meeting no action was taken but attention was called to a debate in the Senate during the week in which Senator Jones of Washington directed notice to the fact that the Northwest section of the country is protesting against the delay in the passage of the water-power bill. The Washington representative of the ELECTRICAL WORLD reports that there is hope that the conferees will have held another meeting by the time this is published.

Senators and Representatives are receiving many letters from their home communities protesting against the inaction of Congress.

ELECTRIC TRUCKS TO BE DISPLAYED IN HARTFORD

Hartford Electric Light Company Plans in Connection with Automobile Show This Month Signalize Co-operative Campaign for Business

The Hartford Electric Light Company will exhibit at the Hartford Automobile Show, beginning Feb. 20, a remarkably varied line of electric trucks, and the occasion will be utilized to demonstrate the practicability of such equipments in the light of local battery service system results and in the perfection of design represented in the most modern electrically driven transportation outfits for road use.

The displays will demonstrate the products of the Commercial Truck Company of America, the Walker Vehicle Company, the Ward Motor Vehicle Company and the Krohn drive truck. Five distinct types of drive will be exhibited so as to show the internal operation of each. All of the electric truck users in Hartford will be invited to inspect and criticise these models.

It is noteworthy that electric truck service at Hartford has been actively maintained despite the obstacles interposed by war conditions, and a new intensity of development and still more vigorous exploitation of the electric passenger and commercial vehicle is scheduled now by the local central-station company in coöperation with the manufacturers and their representatives.

CALIFORNIA CO-OPERATIVE CAMPAIGN SHOWS RESULTS

Committee Says Service of Industry to the Public Must Be Enlarged Still Further for Readjustment Period and After

In its annual report the advisory committee of the California Electrical Coöperative Campaign describes its organization and outlines the progress of its work during 1918 and its plans for 1919.

"The object of this campaign," says the committee, "is better electrical service to the public, and, as the certain result of that service, more profit to individuals and companies in the electrical industry. The nature of the campaign is educational. It is not a sales campaign."

The field representatives appointed to carry out the plans of the committee have spent considerable effort in increasing the membership of the Contractor and Dealer Association and now there is a local in practically every section of the state.

The committee states that central-station men have in most cases been quick to recognize that a greater number of properly equipped and well-operated electrical stores are essential to giving the very best service to the public and therefore to building up to the greatest extent the use of electric service.

The encouragement given to the dealers by these and other similar acts of coöperation is held by the committee to be in no small part responsible for the improvement in their merchandising activities. In speaking of the work of field representatives and conditions in the state the report says:

The greater portion of their time has been spent in assisting the dealers in improving their business methods. Twelve hundred and fifty calls have been made on 390 dealers. Assistance has been given them in the rearrangement and improvement of their stores, in window decorating, improved selling methods and such other assistance as the individual case demanded.

As evidence of improved coöperation among contractor-dealers, twelve dealers are now engaged in two different house-to-house solicitor campaigns covering seven towns and adjacent territory. In addition to these solicitor campaigns fourteen dealers are actively doing house-to-house soliciting.

During the year twenty-one dealers have moved into better stores in better locations, thirteen dealers have made major improvements in their stores involving extensive remodeling, while twenty-three have materially improved their stores by entirely rearranging them. Five dealers have rebuilt their show windows, and forty-six have shown marked improvement in trimming their windows. Twelve new retail stores have been opened during the year, and their are six contractors who, although they have no stores, are actively pushing the sales of appliances. As a result of these various improvements these dealers are now in a position to increase greatly their sales of appliances.

Although the first organized advertising suggestions were not sent out until late in October, the results for November and December were regarded by the committee as very gratifying. Figures compiled from advertisement clippings in the advisory committee's office show that during these two months eleven central stations used 1388 insertions of campaign copy. This work so stimulated the dealers' activity along these lines that during the same period 252 dealers in 117 different localities used 1622 separate all-electrical newspaper advertisements.

In speaking of the accomplishments in 1918 and the promise of 1919 the report says:

During the last year the central stations were shown more than ever before what could be done by the contractor-dealers in coöperative sales campaigns. In localities where this type of work was actively pursued by the dealers under the indorsement of the central stations very gratifying results followed in almost every instance. Through the campaign activities the contractor-dealers found that the generating companies desire to coöperate and to assist the dealer to succeed. The contractor-dealers in turn have responded enthusiastically and have improved their methods and equipment so that they are showing their coöperation with the central stations in many ways, but particularly by improved service to the general public.

The war is now over, and in contrast to the abandonment of association activities in many other trades, the California Association of Electrical Contractors and Dealers is still in existence and stronger than ever, and the organization of the California electrical coöperative campaign is intact and in operation. There exists therefore an organization which has weathered adversity.

The advisory committee is in much better position to give assistance in the educational development of the contractor-dealers during the present period of readjustment and the periods of active business thereafter because of the continuance of its operations during the past year.

Another evidence of the success of the campaign is the readiness with which the contributors to the fund have renewed their contributions for the year 1919.

The California Association of Electrical Contractors and Dealers, the electrical supply jobbers of California and practically all of the central-station companies have renewed their pledges.

The original plans as drawn in 1917 provided for the participation of these three groups only, but at the last minute, in order to complete the funds to the estimated amount required, five manufacturers were invited to contribute to the aggregate amount of $1,320. Three of these have subscribed increased amounts for 1919, and the other two have subscribed the same as in 1918. The committee felt that there should be a more general participation by the manufacturers, and to that end electrical manufacturers generally have already been, or soon will be, given an opportunity to subscribe. Twenty manufacturers have to date subscribed a total amount of $3,250 to the 1919 fund.

The service of the electrical industry to the people of California must be still further improved and enlarged if our industry is to share to the greatest degree in the prosperity that is to come during and after the readjustment period. Coöperation and educational development are the means by which to insure this improved and enlarged service. The contractor-dealers particularly need to develop in this direction. Coöperation in its broadest sense should be theirs during 1919. The California electrical coöperative campaign is in a position now to bring this about to a much greater extent than ever before.

The members of the committee are:

Lee H. Newbert, chairman, manager commercial department Pacific Gas & Electric Company, San Francisco.

G. E. Arbogast, vice-chairman, manager F. E. Newberry Company, Los Angeles.

R. M. Alvord, local manager supply department General Electric Company, San Francisco.

A. W. Childs, superintendent of sales Southern California Edison Company, Los Angeles.

D. E. Harris, vice-president and sales manager Pacific States Electric Company, San Francisco.

H. C. Reid, Pacific Fire Extinguisher Company, San Francisco; past-president California Association of Electrical Contractors and Dealers.

M. L. Scobey, proprietor "Home Electrical," San Francisco.

K. E. VanKuren, district manager Westinghouse Electric & Manufacturing Company, Los Angeles.

A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, Fresno.

FIGHT IN MASSACHUSETTS ON NEW TELEPHONE RATES

Commission Fails to Obtain Temporary Injunction at Preliminary Hearing on Telephone Toll-Rate Matter—Arguments Before the Court

At Boston on Feb. 4 Judge De Courcy of the Supreme Court heard Assistant Attorney-General W. H. Hitchcock of Massachusetts, for the Public Service Commission, and James M. Clark, of Powers & Hall, for the New England Telephone & Telegraph Company, upon the question of the jurisdiction of the commission over the intrastate toll rates recently increased by order of Postmaster-General Burleson in the face of the board's cancellation of the tariff in effect Jan. 21.

Mr. Hitchcock said that a fair and reasonable interpretation of the joint resolution of Congress authorizing the President to take over the telephone systems during the period of the war expressly reserves the right of the several states to control intrastate rates. The police powers of the state, he said, are unamended by the resolution, which particularly states that these are not in any way to be abrogated by the act. The United States Supreme Court has many times declared that the rate-making power is a police power, from Munn vs. Illinois (92 U. S.), the father of all rate cases, as the speaker put it, down. The action of Mr. Burleson in imposing the nation-wide toll rates without giving the states an opportunity to be heard at length represented in the speaker's mind a clear case of an agent violating his authority.

Mr. Hitchcock urged that the court grant a temporary injunction in view of the great difficulty the public faces in regard to securing redress for overcharges if the increased rates are permitted to stand during the present proceedings. The issue will unquestionably be carried to the highest court.

On behalf of the Postmaster-General and for the telephone company, Mr. Clark maintained that the joint resolution gave the President supreme power over rates as well as service during the war period and contended that the commission is without jurisdiction.

Judge De Courcy then assigned the case to the Feb. 11 calendar, stating that he desired to have the pleadings before him before taking action relative to the desired injunction, in view of the importance and gravity of the issues involved.

The Massachusetts Public Service Commission issued an order Jan. 31 canceling the telephone toll rates which were inaugurated by the New England Telephone & Telegraph Company and others on Jan. 21, upon order of Postmaster-General Burleson, and which had been ordered suspended by the commission pending further proceedings. At an adjourned hearing before the commission on Jan. 30 M. B. Jones, then vice-president and now president of the New England company, agreed that the primary issue is one of jurisdiction, and in order that this issue might be raised in the most definite manner and determined promptly he directly challenged and denied the jurisdiction of the board.

PROCEEDINGS IN OHIO

Preparations are being made by the Ohio Public Utilities Commission and Attorney-General Price for proceedings against the American Telegraph & Telephone Company, which is paying no heed to the injunction issued recently in the Common Pleas Court at Columbus restraining it from using the Burleson rates. The Central Union Telephone Company stated that it had taken cognizance of the order, but that a great deal of the long-distance business is handled by the American Telegraph & Telephone Company, on which the Burleson rates are charged.

POWER-PLANT SITUATION IN INDIANA AND KENTUCKY

Coal Is Plentiful, Members of the Indiana Engineering Society Are Told—Stations Rated by Fuel Administration

One whole session of the thirty-ninth annual convention of the Indiana Engineering Society at Indianapolis, Jan. 23, 24 and 25, was given over to the consideration of power-plant subjects. Alex R. Holliday, federal fuel administrator for Indiana, spoke of the phenomenal rise in the price of fuel in that state. Screenings which formerly cost 90 cents per ton rose to $5 per ton. He also said that in 1915 17,000,000 tons of coal were mined, and in the next three years the figures jumped to 19,000,000, 24,000,000 and 30,000,000 tons respectively, the rate in October, 1918, being 36,000,000 tons. Mr. Holliday described the general work of the Fuel Administration and indicated that in Indiana it had been so successful in its campaign of education that there was enough coal on hand in the fall of 1918 to take care of any kind of a winter that might have come, even if the mines had shut down.. He also indicated that there is such a supply on hand at the present time that the mines could shut down for twenty days without any one suffering.

Prof. Frank C. Wagner of the Rose Polytechnic Institute spoke on the "Steam Plants of Indiana in Relation to Fuel Conservation," paying especial attention to the grading of the plants from the Fuel Administration's questionnaires. George W. Hubley, administrative engineer for Kentucky, also gave similar comparative figures for his state. These figures are given herewith:

FUEL ADMINISTRATION'S RATINGS OF INDIANA AND KENTUCKY PLANTS

	Indiana	Kentucky
Number of plants graded	600	557
Number of plants producing power	483	.....
Aggregate horsepower	287,884	.....
Percentage of plants making improvements	38.6	.....
Percentage reporting no deficits in boiler settings	93	.....
Percentage using boiler-feed-water heaters	77	76.9
Percentage weighing coal	57.2	57.3
Percentage measuring boiler-feed water	12	7.3
Percentage using draft gages	12½	11.9
Percentage using CO_2 apparatus	10	5.5
Average grade given plants, per cent	70.13	62.1

H. O. Garman, chief engineer Indiana Public Service Commission, presented a paper on "Public Utilities in the War Period." In his opinion the situation is clearing up much more rapidly than it was expected to do a year ago.

Prof. G. A. Young, Lafayette, Ind., was elected president of the organization, Charles Cheney was elected vice-president, and Charles Brossmann, secretary-treasurer.

Census Bureau Report of Electric Light and Power Stations—1917

	Wyoming			Colorado			Arizona		
	1917	1912	Per cent of Increase * 1912 to 1917	1917	1912	Per Cent of Increase * 1912 to 1917	1917	1912	Per Cent of Increase * 1912 to 1917
Number of establishments	43	20	115.0	69	73	—5.5	29	16	81.2
Commercial	31	18	72.2	53	62	—14.5	25	16	56.2
Municipal	12	2	500.0	16	11	45.5	4	....	....
Income	$1,036,921	$607,095	70.8	$6,364,534	$4,791,340	32.8	$2,141,633	$1,173,186	82.5
Electric service	951,101	595,465	59.7	6,201,865	4,626,693	34.0	1,888,954	1,128,862	67.3
All other	85,820	11,630	637.9	162,669	164,647	—1.2	252,679	44,324	470.1
Total expenses including salaries and wages	$894,375	$445,789	100.6	$4,960,727	$3,997,760	24.1	$1,752,154	$923,258	89.8
Number of persons employed	261	163	60.1	1,269	1,166	8.8	436	217	100.9
Salaries and wages	$259,786	$149,356	73.9	$1,269,608	$999,864	27.0	$451,163	$219,798	105.3
Total horsepower	27,462	11,596	136.8	140,009	131,734	6.3	38,662	22,075	75.1
Steam engines:									
Number	58	45	28.9	105	91	15.4	28	33	—15.2
Horsepower	22,837	10,162	124.7	65,467	56,499	15.9	23,870	12,775	86.8
Internal-combustion engines:									
Number	23	1	2200.0	11	1	1000.0	15	....	....
Horsepower	1,937	100	1837.0	527	80	558.8	3,592	....	....
Waterwheels:									
Number	12	11	9.1	58	64	—9.4	4	4	....
Horsepower	2,688	1,334	101.5	74,015	75,155	—1.5	11,200	9,300	20.4
Kilowatt capacity of dynamos	20,627	8,212	151.2	94,791	71,668	32.3	26,972	14,756	82.8
Output of stations, kw.-hr	27,433,023	11,580,567	136.9	274,223,978	165,196,068	66.0	65,731,753	32,960,084	99.4
Stationary motors served:									
Number	826	672	22.9	8,843	4,780	85.0	1,364	741	84.1
Horsepower	14,957	6,224	140.3	132,013	60,451	118.4	16,505	12,547	31.5
Number of street lamps:									
Arc	339	396	—14.4	3,175	3,859	—17.7	430	454	—5.3
Incandescent, etc	3,728	1,168	219.2	10,238	7,872	30.1	4,194	1,335	214.2

* A minus sign (—) denotes decrease.

	Rhode Island			Delaware, District of Columbia and Maryland			Vermont		
	1917	1912	Per Cent of Increase * 1912 to 1917	1917	1912	Per Cent of Increase * 1912 to 1917	1917	1912	Per Cent of Increase * 1912 to 1917
Number of establishments	9	8	12.5	63	56	12.5	59	61	—3.3
Commercial	8	7	14.3	47	43	9.3	43	48	—10.4
Municipal	1	1	....	16	13	23.1	16	13	23.1
Income	$4,714,851	$2,305,176	104.5	†$9,192,308	†$5,388,403	70.6	‡$2,009,515	‡$1,228,361	63.6
Electric service	$4,410,560	$2,204,999	100.0	$9,008,297	$5,304,333	69.8	$1,937,974	$1,182,797	63.8
All other	$304,291	$100,177	203.8	$184,011	$84,070	118.9	$71,541	$45,564	57.0
Total expenses, including salaries and wages	$3,617,656	$1,654,848	118.6	$7,454,423	$4,213,854	76.9	$1,611,292	$824,443	95.4
Number of persons employed	790	511	54.6	1,399	1,249	12.0	443	340	30.3
Salaries and wages	$760,323	$512,771	48.3	$1,270,721	$936,805	35.6	$350,735	$219,897	59.5
Total horsepower	135,871	50,499	169.1	204,131	116,744	74.8	73,760	50,363	46.5
Steam engines:									
Number	23	18	27.8	74	112	—33.9	32	40	—20.0
Horsepower	131,008	46,934	179.1	199,914	111,622	79.1	17,285	14,996	15.3
Internal-combustion engines:									
Number	5	5	....	16	11	45.4	1	2	—50.0
Horsepower	1,125	1,125	....	1,187	1,073	10.6	50	95	—47.4
Waterwheels:									
Number	17	13	30.8	24	33	—27.3	109	108	0.9
Horsepower	3,738	2,440	53.2	3,030	4,049	—25.2	56,425	35,272	60.0
Kilowatt capacity of dynamos	106,017	38,509	175.3	131,288	89,887	46.0	51,751	29,468	75.6
Output of stations, kw.-hr	161,856,170	62,106,528	160.6	326,439,753	118,034,857	176.6	65,079,504	42,659,884	52.6
Stationary motors served:									
Number	5,283	3,690	43.2	.....	.....	....	3,448	1,966	75.4
Horsepower	72,094	28,186	155.8	188,192	76,527	145.9	43,503	23,695	83.6
Number of street lamps:									
Arc	2,065	3,058	—32.5	5,928	5,404	9.7	356	1,013	—64.9
Incandescent, etc	16,203	10,640	52.3	22,483	16,409	37.0	9,046	5,563	62.6

* A minus sign (—) denotes decrease.
† Exclusive of $1,137,531 in 1917, $622,393 in 1912, reported by street and electric railway companies as income from sale of electric energy for light and power.
‡ Exclusive of $224,884 in 1917 and $110,357 in 1912, reported by street and electric railway companies as income from sale of electric energy.

	Mississippi			New Hampshire			Virginia		
	1917	1912	Per Cent. of Increase* 1912 to 1917	1917	1912	Per Cent. of Increase*, 1912 to 1917	1917	1912	Per Cent of Increase* 1912 to 1917
Number of establishments	97	92	18.3	59	59	....	94	67	40.3
Commercial	46	35	31.4	55	56	—1.8	70	53	32.1
Municipal	51	47	8.5	4	3	33.3	24	14	71.4
Income	†$1,302,397	†$1,167,787	11.5	$3,269,929	$2,328,263	40.4	‡$2,417,086	‡$805,022	200.2
Electric service	$1,283,333	$1,146,583	11.9	$3,093,910	$2,200,733	40.6	$2,372,099	$794,858	198.4
All other	$19,064	$21,204	—10.1	$176,018	$127,530	38.0	$44,987	$10,164	342.6
Total expenses, including salaries and wages	$1,047,670	$878,379	19.3	$2,471,441	$1,596,152	54.8	$2,084,916	$567,459	267.4
Number of persons employed	451	407	10.8	732	578	26.6	561	341	64.5
Salaries and wages	$272,046	$263,793	3.1	$603,027	$434,617	38.7	$453,322	$170,884	165.3
Total horsepower	33,288	30,497	9.2	93,331	84,228	10.8	90,930	59,585	52.6
Steam engines:									
Number	130	128	1.6	46	56	—17.9	86	66	30.3
Horsepower	32,245	30,457	5.9	34,794	25,386	37.1	40,235	15,120	166.1
Internal-combustion engines:									
Number	29	1	2,800.0	11	11	....	24	3	700.0
Horsepower	1,043	40	2,507.5	1,228	1,905	—35.5	921	185	397.8
Waterwheels:									
Number	....	....	....	105	115	—8.7	70	63	11.1
Horsepower	....	....	....	57,309	56,937	0.7	49,874	44,280	12.6
Kilowatt capacity of dynamos	23,246	21,863	6.3	65,560	57,768	13.5	65,913	40,512	62.7
Outout of stations, kw.-hr	30,498,101	27,924,183	9.2	160,456,223	126,593,970	26.7	107,580,758	28,724,684	274.5
Stationary motors served:									
Number	1,217	701	73.6	3,743	1,958	91.2	2,243	753	197.9
Horsepower	13,767	7,955	73.1	41,020	18,488	121.9	27,763	8,570	224.0
Number of street lamps:									
Arc	778	1,663	—53.2	67	1,482	—95.5	813	2,513	—67.6
Incandescent, etc	8,240	4,001	105.9	14,768	9,100	62.3	12,813	4,369	193.3

* A minus sign (—) denotes decrease.
† Exclusive of $583,515 in 1917, $273,217 in 1912, reported by street and electric railway companies as income from sale of energy.
‡ Exclusive of $3,325,008 in 1917, $2,007,620 in 1912, reported by street and electric railway companies as income from sale of energy for light or power.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

American Electrochemical Society.—The spring meeting of the American Electrochemical Society will take place at the Chemists' Club in New York City on April 3, 4 and 5.

New Company Section of N. E. L. A. Formed.—Announcement is made that a new company section of the National Electric Light Association is being formed in connection with the Wisconsin Power, Light & Heat Company.

I. E. S., New York Section.—A meeting of the New York Section of the Illuminating Engineering Society will be held in the Engineering Societies Building on Thursday evening, Feb. 13. Preston S. Millar will speak on "Lighting in Wartime," and H. A. Hornor on "Lighting in Shipyards."

Electrical League of Cleveland.—Col. John R. McQuigg, commander of the 112th Engineers in France, spoke on his war experiences before the Electrical League of Cleveland at its Jan. 30 meeting. On Jan. 23 the league was addressed by Dr. D. C. Tremaine of the United States Shipping Board, his subject being "Till the Boys Come Home."

Officers of Western Society of Engineers.—At the annual banquet of the Western Society of Engineers at Chicago on Jan. 22 the election of the following officers for the ensuing year was announced: President, A. S. Baldwin; first vice-president, Kempster B. Miller; second vice-president, William M. Kinney; third vice-president, J. L. Hecht; treasurer, C. R. Dart; trustee, E. T. Howson.

Commonwealth N. E. L. A. Activities Open.—Athletic and social affairs of the Commonwealth Edison Company section, National Electric Light Association, which were summarily dropped during the war, have again come to the front. These activities will be resumed on a larger scale than ever before. The proposed program includes seven important evening entertainments, which will be free to all members in good standing.

Joint Meeting of San Francico Engineering Societies.—On Jan. 24 there was a joint meeting in San Francisco of the local sections of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Mining Engineers, American Institute of Electrical Engineers and American Chemical Society, held under the auspices of the Electrical Engineers. The subject of the evening was "A Symposium on Engineering Education," and talks were made by J. W. Beckman, representing the chemical engineers; John A. Britton, representing the mechanical engineers; C. L. Cory, representing the electrical engineers; C. D. Marx, representing the civil engineers, and T. A. Rickard, representing the mining engineers. The purpose was to discuss different viewpoints on the subject in an endeavor to develop constructive comment. A considerable number of those present participated, with the result that some fallacious views were shown to be unpopular and there was general agreement as to the necessity of so equipping the engineer at college that he will be able to take a broad view of the problems he meets later. A grounding in fundamentals was considered more important than endeavoring to fit men for special tasks.

Bolshevism Discussed by General Tripp.—At the recent Westinghouse Veteran Employees' banquet in Pittsburgh General Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, spoke on the menace of Bolshevism, dwelling upon the chaotic conditions in Russia and declaring that largely upon America's stand depends the advancement of the world toward a higher civilization or its retrogression into the darkness of the Middle Ages.

N. E. L. A., Brooklyn Edison Section.—On. Jan. 21 T. J. Jones, general sales agent of the Brooklyn Edison company, addressed the Brooklyn Edison Section of the National Electric Light Association on "The Development of Our Business During the Year 1918." He spoke of the part of Brooklyn and the Brooklyn Edison company in the war. An address was also given by W. W. Freeman, president of the Union Gas & Electric Company, Cincinnati, who is also chairman of the N. E. L. A. public policy committee.

Philadelphia Electric Company Section, N. E. L. A.—G. B. Regar addressed the commercial department branch meeting held on Jan. 28 by the Philadelphia Electric Company section of the National Electric Light Association. His subject was "Curtailment of Lighting Due to the War." On the evening of Feb. 4 Lieut. Edouard V. M. Isaacs, said to be the only American naval officer taken prisoner during the war, will relate his martial experiences before the main section meeting in the Bellevue-Stratford ballroom.

Engineers' Club of Philadelphia.—At a special meeting of the Engineers' Club of Philadelphia to be held in the club house on the evening of Feb. 15 H. F. Moore, professor of experimental engineering at the University of Illinois, will present a paper, illustrated with lantern slides and motion pictures, entitled "The Fatigue of Metals." Major Nevil M. Hopkins of the Ordnance Department, U. S. A. and a member of the faculty of the George Washington University, will give a paper on "The Outlook for Research and Invention" at the regular meeting of the club to be held on Tuesday evening, Feb. 18.

American Institute of Electrical Engineers

Boston Section.—Dr. A. E. Kennelly of Harvard, who has recently been in Europe, spoke on "Some Features of Electrical Engineering in the War" on Feb. 4.

Philadelphia Section.—Guilliam H. Clamer had for his topic "Oscillatory Currents in Electric Furnace Practice" at a recent joint meeting of the A. I. E. E. On Feb. 10 Prof. Joseph W. Richards will speak on "The Importance of the Electrochemical Industry."

Detroit-Ann Arbor Section.—Prof. John C. Parker of the University of Michigan gave a "round-table" talk on "Direct-Current Generators" at the Jan. 31 meeting. Cassius Davis of the General Electric Company will have "Automatic Substations" as his subject on Feb. 14.

Washington Section.—H. A. Hornor will speak on "The New Application of Electricity to Ships" at the Feb. 11 meeting. "Industrial Uses of Electricity" will be the subject of the meeting to be held on March 11, and W. D'A. Ryan will talk on "Illumination" at the April 8 meeting.

Erie Section.—Prof. Comfort A. Adams will speak on the subject of "Arc Welding as Applied to Shipbuilding" at a joint meeting of the Engineers' Society of Northwestern Pennsylvania and the Erie Sections of the A. I. E. E. and the A. S. M. E. This meeting will be held in the Erie Board of Commerce Rooms on Feb. 11.

Baltimore Section.—H. L. Hess of the Hess Steel Corporation recently gave an illustrated lecture on "Electric Furnaces as Applied to Steel Making" when the Baltimore Section met jointly with the mechanical engineers. Col. William H. Walker, commanding officer of the Edgewood Arsenal, will speak on "The Manufacture and Use of Toxic Gases in Modern Warfare" at the Feb. 14 meeting.

Rochester Section.—"The Chicago, Milwaukee & St. Paul Electrification" was the subject of a recent address by E. S. Johnson. S. M. Day of the General Railway Signal Company read a paper on "The Elements of Alternating-Current Signaling" before the meeting on Jan. 24. F. C. Taylor, Rochester Railway & Light Company, recently read a paper on "Increased Production by Correct Illumination."

Pittsfield Section.—A. L. Powell, illuminating engineering department of the Harrison Lamp Works, gave a lecture illustrated by motion pictures and stereopticon slides on "The Manufacture of the Modern Incandescent Lamp" before a recent meeting. Illustrated lectures by William Henry Blood on "The Building of Hog Island Shipyard —A Great Achievement of a Great Epoch" and by Prof. Comfort A. Adams on "Arc Welding as Applied to Shipbuilding" and an address by Allen T. Treadway on "War-Time Legislation" have been given before recent meetings.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

International General Electric Company Officers.—P. M. Haight has been elected secretary and treasurer of the International General Electric Company and W. J. Edmonds auditor. These are in addition to the other general officers mentioned previously in the ELECTRICAL WORLD.

Development Program of Southern California Edison Company. — The Southern California Edison Company has been given authority by the California Railroad Commission to issue $8,000,000 general and refunding twenty-five-year 6 per cent bonds, due January 1, 1944, and $8,000,000 of ten-year 7 per cent serial debentures. None of the aforesaid bonds shall be sold for less than 93 and interest; the debentures must bring 95 and interest. During the hearing it was brought out that the development program of the company for the next three years calls for the expenditure of $18,945,000.

Muncie (Ind.) Company Drops Plea for Higher Rates.—The petition of the Indiana General Service Company, Muncie, Ind., asking for a surcharge on electrical energy supplied twenty-eight cities and towns was dismissed by the Indiana Public Service Commission on the request of R. E. Breed, president of the company. In the motion for dismissal Mr. Breed said that, in view of the termination of the war, it is possible that in the near future the cost of coal, supplies, labor and materials required for operation of electric utilities will be reduced in price to such an extent that it may not be imperative for the petitioner to secure the increases in rates asked for.

New Electric Ordinance for Duluth.—The city of Duluth, Minn., has just compiled in a single ordinance all rules relating to building, plumbing, heating and electrical construction. One of the radical provisions of the ordinance, according to A. W. Lindgren of the Northern Electric Company, is that any one taking out an electrical permit must pay a fee the size of which depends on the nature and size of the job. For the purpose of discussing this ordinance the local electrical contractor-dealers had a meeting recently with the city's building inspector and electrical inspector. It was there decided to distribute copies of the ordinance among all electrical men, including journeymen, in the city, so that every one might familiarize himself with its provisions. It is felt by electrical people that this ordinance will improve the outlook for construction.

Applications of Electroplating.—Appropriations have been requested by the Department of Commerce to permit more exhaustive study by the Bureau of Standards of plating problems and their application to various manufacturing industries. Electroplating forms an excellent illustration of a "key industry," that is, an industry which, while it is not itself of great magnitude, is often of fundamental importance to larger industries. Progress in the art will bring about corresponding improvements in all such industries. Pending appropriation of funds to conduct extended investigations on electroplating, arrangements have been made by the Bureau of Standards to obtain information regarding the kinds and methods of plating now in commercial use.

Canadian Central Stations. — The Dominion Bureau of Statistics, in cooperation with other departments, has completed a census and directory of the central electric power stations in Canada, including only stations developing electric power for sale. The capital invested in power stations reaches a total of $356,004,168, of which 79.5 per cent is invested in commercial stations and 20.5 per cent in municipal or publicly owned stations. The total revenue derived from the sale of electrical energy is $44,536,848, of which $29,135,399 was secured by commercial and $15,401,449 by municipal plants. The primary power installation in central stations totals 1,844,571 hp., of which 1,652,661 hp. is derived from water, 180,800 hp. from steam, and 11,700 hp. from gas and oil. The actual cost of construction of hydroelectric power stations per installed horsepower (omitting real estate, transmission and distribution equipment) for seventy representative stations throughout Canada with an aggregate turbine installation of 745,797 hp. was $50,740,458, being an average cost of $69.11 per installed turbine horsepower.

Government Radio Stations. — The United States has now in operation at Annapolis, Md., the largest radio station in the world, and one of even greater power is nearing completion in the vicinity of Bordeaux, France. The erection of these two stations was for emergency purposes which necessitated that they be of sufficient power to assure direct communication between this country and Europe under any climatic conditions. To the Washington representative of the ELECTRICAL WORLD Admiral Griffin, chief of the Bureau of Steam Engineering, Navy Department, said: "The Annapolis station was the result of an attempt by the enemy to cut the cables which furnished communication between this country and our allies. This station is the finest in this country and far better than the one at Arlington, Va. But by far the most complete radio station in the world is nearing completion in the vicinity of Bordeaux, France. This station was erected by the United States government and will be of such tremendous power that it will overcome any static conditions which may exist. The material for this station is now in France, and notwithstanding the fact that an armistice has been signed, it will be completed. Upon its completion it is probable that the French government will take it over."

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Extension Not Justified.—The complaint of Attorney-General T. A. Walters against the Rupert Electric Company based on the rates charged by the latter has been dismissed by the Idaho Public Utilities Commission. An extension of lines for electrical heating was asked, but it was found the cost would be from $5,000 to $10,000, and the commission thought this was not justified. The commission ordered this company to return to all consumers the $10 charge required for installation of meters.

Changing Rates When Company Is Absorbed.—To further the efforts of the Mount Whitney Power & Electric Company to purchase the properties of the H. G. Lacey Company, a utility furnishing light, heat and power in Hanford, Kings County, the California Railroad Commission has authorized the Mount Whitney company to issue $200,000 of 7 per cent preferred stock in payment for the $101,000 of the H. G. Lacey Company's stock owned by the Huntington Land & Improvement Company. The Southern California Edison Company is given permission to purchase the $200,000 of the 7 per cent preferred stock of the Mount Whitney company for $164,353.57 cash, plus interest at 6 per cent from July 1, 1918, to the date of the transfer. In a recent decision the commission held that the rates of the Lacey company are reasonable and yield a reasonable return on the investment, notwithstanding that the rates are lower than those charged by the Mount Whitney company on other portions of its system. At the hearing on the petition H. G. Bauer, representing the Mount Whitney company, said that if the application were granted he intended to make the rates uniform. Referring to this, the Railroad Commission says: "The proposition of authorizing a public utility corporation earning a reasonable return to sell its properties, and then permit the purchasing company to increase the rates charged the consumers served by the corporation whose properties are sought to be acquired because the existing rates of the purchasing company may not be remunerative, does not meet with our approval."

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Bert H. Peck, to whom was awarded the Chanute medal at the annual dinner of the Western Society of Engineers on Jan. 22, was graduated from the University of Wisconsin in 1906. After graduation he was employed for

B. H. PECK

one year by the Chicago Telephone Company and left that position to join D. C. & W. B. Jackson, consulting engineers of Chicago, where he remained until 1914. He then was employed by the Public Utilities Commission of Illinois as electrical engineer, which position he still holds. Mr. Peck is a member of the American Institute of Electrical Engineers, the Western Society of Engineers and the Electric Club of Chicago and is a past-president of the Springfield (Ill.) Engineers' Club. Since his graduation from the University of Wisconsin he has also taken the degree of electrical engineer at the same school. The paper upon which he received the award of the Chanute medal was entitled "The Engineering Data Necessary for an Electric Rate Determination." (See ELECTRICAL WORLD, April 20, 1918, page 825.)

R. M. Howard, manager of all departments of the Wisconsin Railway, Light & Power Company, except the La Crosse Street Railway, has been appointed general manager for the company at La Crosse, succeeding Dean Treat, who resigned. Mr. Howard will coöperate with Peter Valier, vice-president, who will be resident executive officer, having jurisdiction over all departments including Winona and Hatfield. Mr. Howard has been with the Wisconsin Railway, Light & Power Company since it was organized in 1913, having previously held the same position for two years with the receiver of the La Crosse Water Power Company. He has heretofore had charge of the power and electrical department of the company, including the Hatfield dam, the hydroelectric power station, the power transmission lines from Hatfield to La Crosse and Winona, the substations and distribution system in La Crosse, the Onalaska electric utility and steam-power stations and electric distribution system in Winona, and the Winona Street Railway. Prior to becoming connected with the Wisconsin Railway, Light & Power Company, Mr. Howard was general manager of the Green Bay Traction Company, the Green Bay Gas & Electric Company and the Northern Hydro-Electric Power Company, Green Bay, which have since been consolidated under the name of the Wisconsin Public Service Company. Before going to Green Bay Mr. Howard was general manager of the Clinton (Iowa) Street Railway for nine years.

C. A. Hall has been promoted from assistant general manager to general manager of the Eastern Pennsylvania Light, Heat & Power Company and the Eastern Pennsylvania Railways, Pottsville, Pa., by the J. G. White Management Corporation, New York, N. Y., the operating managers. Mr. Hall succeeds L. S. Cairns, deceased. In June, 1918, Mr. Hall entered the service of the two Eastern Pennsylvania companies as manager of the electric light and power department and shortly thereafter was advanced to the position of assistant general manager. After leaving school

C. A. HALL

in 1904, Mr. Hall entered the employ of the Consolidated Light Company, Huntington, W. Va. In 1907 he joined the organization of the Ohio Valley Electric Railway, Huntington, W. Va. He became superintendent of the Canonsburg (Pa.) Electric Light, Heat & Power Company in 1909, and following the purchase of this utility in 1911 by the West Penn Power Company, Pittsburgh, Pa., he was made local manager of that company at Canonsburg.

Henry J. Gille, sales manager of the Puget Sound Traction, Light & Power Company, Seattle, Wash., has been elected president of the Northwest Electric Light and Power Association by the executive committee to fill the

H. G. GILLE

unexpired term of L. B. Faulkner, who resigned on account of the pressure of his new duties as president of the Olympia Light & Power Company. Mr. Gille was formerly contract agent for the Minneapolis General Electric Company. He was also at one time associated with the St. Paul Gas Light Company.

Thomas Pitts has been promoted from superintendent of the Hutchinson section of the Southwestern division of the Northern States Power Company to be assistant to the manager at Montevideo, Minn.

Henry G. Kobick, who prior to his enlistment in the aviation section of the United States Army, was superintendent of the employment bureau of the Commonwealth Edison Company, Chicago, has been appointed assistant to the general manager of electric shops for the same company. This position gives him jurisdiction, under E. A. Edkins, of all matters pertaining to merchandise sales and adjustments in all the company's electric shops.

Obituary

Minor Q. Woodward, treasurer and manager of the Pine Bluff Company, died at his home in Pine Bluff, Ark., on Dec. 8, following an attack of influenza. Mr. Woodward was born in Jackson, Tenn., Sept. 27, 1891. He went to Pine Bluff in his early youth, attending the city school until the age of sixteen when he was employed as lineman with the Pine Bluff Water & Light Company. Mr. Woodward advanced rapidly with the company, and prior to his appointment as manager on May 1, 1917, he had been for some time assistant manager and claim agent. In addition to his work with the company, Mr. Woodward took an active interest in civic affairs.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

CONSOLIDATION EXPECTED IN VACUUM-CLEANER FIELD

Arrangements Made by Frantz Premier, General Electric and Edison Electric Appliance to Form Ten-Million-Dollar Corporation

Negotiations which have been pending for some time were virtually completed this week, except for minor details, for a merger of prominent electric vacuum-cleaner interests. According to reports in Cleveland papers, the Frantz Premier Company, the General Electric Company and the Edison Electric Appliance Commpany, Inc., have made arrangements for the formation of the General Vacuum Cleaning Corporation with headquarters at the present plant of the Frantz Premier Company in Cleveland, where operations will be carried on.

The new company was organized under the laws of New York State with an authorized capital of $10,000,000. The Edison Electric Appliance Company, it is reported, will turn its vacuum-cleaner business over to the new company.

The officers of the new company anticipate a very large growth in the vacuum-cleaner business not only for the domestic trade but also for export.

STEPS TAKEN TO INCREASE TURNOVER OF LAMP STOCKS

Distribution Through Agents, Which Is Rapidly Increasing, Now Equal to That Through Central Stations

With the war's demand to eliminate special goods and hold only to standards the desire on the part of lamp manufacturers to determine what are standards and what are non-essentials has been stimulated.

To both the lamp manufacturer and the lamp dealer the question of stocks is a very important one. Excess stocks mean slower turnover of investment to the former and wasted storage space to the latter. Therefore, to increase the rate of turnover and cut down the storage space necessary for stock, there has been effected a standardization of lamps, the importance of which manufacturers are endeavoring to impress upon agents.

In the matter of lamp sales by manufacturers to central stations and agents it is interesting to note that a couple of years ago about two-thirds were to central stations and one-third to agents. Since then sales to lighting companies have fallen off while distribution through agents has increased considerably, so that at the end of the past year each branch of the industry absorbed approximately the same number. It is predicted that in two years they will have changed places—one-third to the central stations and two-thirds to agents.

Gas-Filled Lamp.—In this type of lamp, built in sizes from 75 watts to 1000 watts, the greatest demand has been for 100-watt units, closely followed by the 75-watt size. In the last half of the past year the 75's gained in percentage sold over the 100-watt size, and at the present time they are holding about equal in volume of sales. These are the standard stock sizes for the average agent. The 200-watt size has about one-third the demand of the 100-watt size, and the average lamp agent has very little call for it. The 220-250-volt lamps have little demand in the States, although foreign buying is very appreciable.

Tungsten Vacuum Lamp.—Using 110 to 125 volts, the standard lamps are the 40, 25, 60 and 50-watt, with the sales in the order named. In 1918 the 40-watt size held about 36 per cent of the sales, the 25-watt about 32 per cent, the 60-watt about 19 per cent and the 50-watt about 13 per cent. Some central stations have pushed the 60-watt lamp on account of higher energy consumption, but this capacity has been found by some utilities to give too much light for household uses. In many cases the 40-watt unit, of course, is too small. Several central stations in the East have pushed the 50-watt lamp as best adapted for average household uses, and they are strongly advocating its general adoption. In the past year the 50-watt lamp has nearly doubled its proportion of sales over the previous year among the three other lamps of its class.

Carbon Lamp.—During 1918 about 90 per cent of the lamps sold were tungstens, the remaining 10 per cent being carbons. Until a tungsten lamp is brought out that can compete in ruggedness and price also with the carbon, it has been stated by persons in the lamp industry, there will be a certain demand for the carbon lamp in places where a rugged filament is desirable. The Fuel Administration's recommendations have caused central stations to stop supplying Gem lamps. At the present time the Gem lamp is practically dead.

MINIATURES

Flashlight Lamps.—Seven former flashlight lamps have been placed on the inactive list, leaving nine lamps to supply the trade. Of the five retained for two-cell and three-cell flashlight batteries, dealers, it is understood, will probably stock three. Besides, there is one for a five-cell flashlight battery, two for a single and one for a double standard dry battery. This cut of nearly 50 per cent in flashlight lamps, manufacturers state, will considerably simplify stocks.

Automobile Lamps.—The three-cell, 6-volt storage battery, with or without generator lighting system, is the prevailing type. Of the forty lamps heretofore built for this service twenty-four have been rendered inactive and sixteen retained, exclusive of those for use on the Ford car. At the present time 85 per cent of the lamps are for single contact, and the tendency is toward the grounding system, but until that happens dealers will have to keep stocks of both single and double contact lamps, although the latter may be small. Probably only eight of the sixteen need be stocked.

For Ford car service, which comprises a very large percentage of the automobile business, three lamps are made, but the gas-filled lamp and the large-bulb vacuum lamp seem to have the biggest demand. These are 9-volt lamps burned two in series on a magneto lighting system, but it is anticipated that in the near future a compensator will be installed which will permit the burning of two 6-volt lamps in parallel. However, while present cars are on the road the 9-volt lamps will, of course, have to be stocked.

As there are probably 7 per cent of the automobiles equipped with 12-volt to 16-volt batteries, there is a demand for some lamps for this voltage. Six lamps of this size were dropped from the active list, while twelve were retained. All of the ten lamps for batteries of 18 volts to 24 volts have been placed on the inactive list, so none are regularly carried in stock. The same is true for the twelve lamps formerly carried for electric vehicle service, for operation on 30, 40, 60 and 80 volts.

Candelabra Lamps.—Sixteen lamps have been retained, while four were dropped. Most of this stock goes to fixture

houses and central stations, so the average lamp dealer is not required to stock them.

Gas-Filled Tubular Projectors.—There have been standardized ten of these lamps for stereopticon and motion-picture service, in three bulb lengths. Two are for 6 volts, two for 12 volts, three for 30 volts and three for normal lighting service of 110 to 125 volts.

ANALYSIS OF THE EFFECT OF PRICE GUARANTEEING

There Are No Indications that Such a Procedure Stimulates Buying for the Purpose of Stock Replacement

Guaranteeing prices against decrease for a certain specified period has a limited number of followers in the electrical manufacturing line. It is held, of course, by those in its favor to be a strong means of strengthening the market and encouraging buying. Most of the guarantees in the electrical field, however, which have been reported cover only through March or April. A guarantee for such a short time can hardly encourage stock purchases unless the goods have a rapid turnover, in which case no guarantee will be necessary. It is very apparent that distributers and dealers are not going to lay in a large amount of stock when it is evident that the trend of the market must be downward. Any attempt to delay this downward trend for a couple of months by a fixed guarantee offers the buyer no assurance that the market will not decline after the guarantee date, and consequently there is nothing to stimulate him to purchase for stock purposes. Apparently, therefore, guarantees of short duration lose their beneficial effects.

If guarantees are made through June 30, as has been the case in some lines of electrical equipment, stocks may be laid in provided that the distributers can foresee a market. It is more likely, however, that the distributers will wait until the supplies are needed. In fact there are no indications that even if prices were guaranteed for a year or more distributers would lay in stocks until a building demand develops.

Furthermore, a guarantee through June 30 gives relief, if any, but for the moment. During the month or six weeks prior to June 30 the same condition arises as came with the signing of the armistice, unless of course a further guarantee is made. Looking back over the past year of government control of prices will disclose this fact very forcefully. Whenever the time for the limit of a government-made price, as in copper, drew near buying began to fall off, and it did not awaken until the new price or set of conditions was announced. There is no reason to believe at the present time that other conditions will result in the electrical field where prices are fixed.

Price fixing is in defiance of the laws of economics and can hardly be expected to stimulate and revive a slow market. It is apparent, of course, that manufacturers are unwilling to sacrifice prevailing high prices and current profits. The writing on the wall has clearly stated for some time that buying must be stimulated by lower prices. This, however, may be accomplished without a very serious loss in total profit.

It is a well-known fact that goods which turn over once a year, bringing say 20 per cent gross profit, do not yield so much profit on the investment as an article with one-quarter the gross profit per sale but with a turnover once a month or more often. Turnover, in other words, is the answer to profits. With high war prices the impulse to buy is dormant. This impulse must be awakened. Guarantees against a drop in price for a short time merely put off the day of awakening.

It is generally recognized, and by merchandisers such as department stores especially, that one way to move goods is to make a concession in price. It is true that labor is still high and that stocks of raw materials purchased at high prices are still on hand. Nevertheless, the profit is there. If there is a latent demand, a cut in price by taking less profit, it seems reasonable to believe, would bring more sales than continued high prices. Sufficient sales, though at lower profit, bring a better total return. Incidentally labor is kept better employed when sales run large. This is not a factor which should be altogether ignored in a consideration of prevailing market conditions.

DETAILED EXPORT FIGURES FOR LAST FISCAL YEAR

Classification Is Made Not Only According to Articles but Also According to the Countries of Import

Detailed figures of exports of electrical merchandise for the fiscal year ended June 30, 1918, classified according not only to articles but also to the countries of import, have just become available. These figures, which were compiled by the Bureau of Foreign and Domestic Commerce, are to be found on the two following pages. In comparing these figures with similar figures for previous years two things must be kept in mind, namely, that prices are higher and that the figures are for the first complete year during which the United States was at war. While the war had been going on for nearly three years, it was not until April, 1917, that this country became engaged. After that, of course, rulings by the War Trade Board limiting exports and making all exports subject to license had an effect upon the exports of electrical merchandise.

METAL MARKET SITUATION

Resale Copper Quoted Last Week at 18.75 Cents to 19 Cents per Pound—Old Metals Decline

During the past week the market has not shown very extensive buying. Nearly all metals evidenced a drop in price ranging from ½ cent to 1½ cents. The latter figure is shown for prime Lake copper. Electrolytic copper has sold in the open market at 18.75 cents to 19 cents per pound. The large producing interests ignored these small-lot sales and adhered to their nominal price of 23 cents, but revision of this price is expected in the near future. Until consummers are ready to contract for future supplies in considerable tonnages the producers contend that there is nothing to be gained by reducing the price.

The large amount of scrap copper which the government is offering has a depressing effect on the whole situation as much of this metal can be used in place of the electrolytic copper.

The reduction in freight rates has caused a decline in price of most metals in London.

NEW YORK METAL MARKET PRICES

	Jan. 28			Feb. 4		
Copper:	£	s	d	£	s	d
London, standard spot	89	0	0	88	0	0
	Cents per Pound			Cents per Pound		
Prime Lake	21.00			19.50		
Electrolytic	19.25			18.50		
Casting	18.00			17.75		
Wire base	22.75*			22.75*		
Lead, trust price	5.50			5.25		
Antimony	7.50			7.37½		
Nickel, ingot	40.00			40.00		
Sheet zinc, f.o.b. smelter	13.00			13.00		
Spelter, spot	7.00			6.75		
Tin	Govt. price 72.50			Govt. price 72.50		
Aluminum, 98 to 99 per cent	Govt. price 33.10			Govt. price 33.10		

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	15.50 to 16.00	14.50 to 15.00
Brass, heavy	9.00 to 9.50	8.50 to 9.00
Brass, light	7.00 to 7.50	7.00 to 7.50
Lead, heavy	4.50 to 4.75	4.25 to 4.50
Zinc, old scrap	5.00 to 5.25	5.00 to 5.25

* Normal.

UNITED STATES EXPORTS OF ELECTRICAL MACHINERY AND APPLIANCES BY COUNTRIES DURING THE YEAR ENDED JUNE 30, 1918

Countries	Batteries	Carbons	Dynamos or Generators	Fans	Heating and Cooking Apparatus	Insulated Wire and Cables	Interior Wiring Supplies (Including Fixtures)	Arc Lamps	Carbon-Filament Lamps	Metal-Filament Lamps	Magnetos and Spark Plugs	Meters and Measuring Devices	Motors	Rheostats and Controllers	Switches and Accessories	Telegraph Apparatus	Telephones	Transformers	All Other
Azores and Madeira Islands	$13	.....	.....	.....	.....	$880	.....	.....	.....	$1,210	$18	.....	$1,113	.....	.....	.....	$900	.....	$44,289
Denmark	178	.....	$570	.....	.....	2,997	$7,260	.....	.....	.....	3,879	$74	462	.....	.....	$1,376	521	.....	70
Finland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
France	100,511	$7,748	444,021	$94	$822	795,659	126,778	.....	.....	3,015	349,987	3,467	305,061	$16,478	$67,473	42,769	186,006	$465,018	859,878
Gibraltar	.....	.....	185	.....	.....	.....	.....	.....	.....	.....	.....	.....	148	.....	.....	.....	.....	.....	.....
Iceland and Faroe Islands	.....	.....	432	.....	.....	7,414	550	.....	.....	.....	315	.....	90	.....	.....	.....	702	.....	4,250
Italy	7,331	149,385	29,890	45	25,568	77,726	77,541	.....	$1,474	24,041	758,868	59,245	180,357	1,554	107,821	8,899	154,410	71,027	893,812
Netherlands	435	622	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	276	.....	70	.....	76,557	.....	91,775
Norway	18,623	100,627	29,890	469	10,680	157,313	7,535	.....	.....	279	12,162	1,634	78,126	445	92,942	.....	.....	101,400	312,101
Portugal	5,907	100	466	.....	126	7,404	12,461	.....	.....	1,241	2,498	68	2,750	16	1,682	.....	1,334	212	8,462
Russia in Europe	50,758	20,623	41,570	18	.....	406,426	1,526	.....	.....	3,550	45,153	13,811	196,781	1,054	14,368	3,680	18,217	76,300	136,903
Spain	30,429	1,189	21,316	7,332	21,898	118,434	18,237	$449	.....	12,568	68,604	74,104	212,782	685	49,026	.....	17,587	74,204	294,100
Sweden	3,175	550	.....	.....	.....	3,933	.....	.....	.....	.....	659	75	1,239	.....	.....	.....	.....	.....	4,925
Switzerland	.....	.....	.....	.....	74	13,856	1,995	.....	.....	.....	401	123	4,096	127	353	.....	2,110	108,373	156,853
England	678,568	56,136	26,379	4,024	1,683	112,426	112,278	.....	.....	4,278	715,464	61,607	849,548	618	63,208	36,672	117,380	1,763	2,226,217
Scotland	27,094	11,274	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,691	.....	.....	300	.....	.....	6,163
Ireland	570	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,333
Bermuda	3,497	.....	.....	86	109	968	712	48	.....	379	289	74	44	.....	343	.....	673	1,181	4,449
British Honduras	4,150	116	14	10	11	1,495	536	.....	144	2,056	539	97	97	8	310	4,035	361	.....	3,588
Canada	1,016,362	794,249	440,516	130,935	212,515	206,678	405,471	5,087	94,293	803,785	490,258	292,632	1,537,963	81,619	251,122	68,649	293,285	238,138	4,583,718
Costa Rica	1,928	880	117	.....	263	916	3,458	.....	102	3,427	226	16	5,503	.....	163	.....	1,382	3,557	17,288
Guatemala	1,858	2,880	2,612	120	583	9,858	2,128	95	85	7,069	432	32	3,629	40	673	1,516	965	571	12,595
Honduras	5,028	1,386	2,816	272	193	4,709	1,738	.....	595	5,208	457	976	759	10	1,768	636	2,237	1,577	14,388
Nicaragua	2,885	30	1,701	224	.....	2,064	725	.....	470	3,398	976	168	4,266	13	391	18	296	614	24,918
Panama	29,309	674	62,468	2,955	17,342	406,078	36,841	150	313	40,438	9,087	34,906	46,916	1,465	86,955	2,930	71,367	52,486	171,530
Salvador	10,467	726	447	1,045	637	11,292	2,429	177	214	9,450	583	1,423	972	57	951	.....	1,356	4,061	9,391
Mexico	75,336	22,535	60,249	20,490	23,284	214,906	67,568	2,687	16,819	252,496	20,573	85,976	162,056	4,731	101,091	3,259	38,815	79,793	421,495
Miquelon, Langley, etc	1,760	.....	.....	.....	.....	97	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	109
Newfoundland and Labrador	41,452	5	2,891	42	231	24,421	7,686	.....	.....	13,311	2,199	4,161	26,492	173	3,159	994	1,933	9,386	21,008
Barbados	1,752	.....	1,935	15	18	459	339	.....	.....	1,414	608	.....	708	295	86	.....	965	481	7,606
Jamaica	8,478	346	2,296	194	115	9,729	1,383	.....	155	4,193	2,627	1,232	9,218	57	735	361	6,067	726	24,145
Trinidad and Tobago	6,100	554	2,992	161	3,616	11,187	1,645	.....	417	5,883	3,926	2,580	4,739	387	1,325	.....	3,696	1,339	21,681
Other British West Indies	3,418	46	7,972	276	.....	2,483	597	.....	.....	1,116	489	795	941	142	5,364	84	1,637	.....	8,009
Cuba	160,582	10,981	309,132	42,482	12,489	625,681	154,064	1,398	10,206	416,356	45,748	60,982	405,266	24,851	139,491	5,882	85,283	133,445	772,381
Danish West Indies	565	1,036	550	16	6	571	671	.....	205	1,407	109	2,145	1,497	70	40	.....	382	.....	2,479
Dutch West Indies	1,246	8	840	44	.....	3,592	455	26	9	1,985	823	.....	657	.....	1,000	.....	995	1,055	17,709
French West Indies	2,291	154	550	85	4	392	727	.....	.....	1,968	999	16	1,153	.....	75	159	1,126	.....	5,646
Haiti	1,012	487	45,065	38	9,587	20,730	4,175	.....	54	1,891	522	2,239	17,410	.....	3,986	72	507	6,985	31,551
Dominican Republic	6,655	564	21,064	970	233	15,929	4,295	332	101	10,438	3,817	2,442	48,385	498	1,912	868	3,820	5,304	59,660
Argentina	151,923	41,562	39,407	23,815	29,419	546,548	108,099	.....	846	355,303	106,610	119,081	264,654	2,620	122,016	159	126,879	79,535	507,687
Bolivia	587	15	703	.....	645	1,453	5,308	.....	.....	5,152	14	31	4,601	217	639	.....	.....	2,366	11,791
Brazil	77,212	18,871	57,167	14,716	16,508	715,552	100,120	111	4,866	440,962	36,740	129,103	163,462	2,440	155,216	6,680	522,779	228,932	491,579
Chile	35,906	14,189	223,909	1,589	19,817	356,762	80,290	.....	3,503	182,956	31,644	33,515	264,785	7,184	179,255	4,458	31,277	96,598	595,250
Colombia	14,547	274	12,790	1,610	1,322	40,444	19,791	25	809	74,095	2,667	2,737	30,378	228	3,679	1,215	6,353	10,842	60,492
Ecuador	3,818	289	9,118	2,276	792	15,461	6,943	70	903	10,039	2,268	1,524	9,656	.....	2,713	88	742	3,358	29,975
Falkland Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
British Guiana	4,897	662	922	284	144	1,331	1,614	.....	.....	6,364	6,031	1,297	6,123	141	1,383	42	2,372	216	7,549
Dutch Guiana	264	.....	25	49	.....	68	.....	.....	.....	98	53	22	295	.....	.....	32	98	.....	431
French Guiana	142	80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	61	25	.....	.....	.....	.....
Paraguay	307	.....	.....	.....	.....	1,821	1,093	.....	.....	.....	155	206	5,918	.....	.....	.....	139	.....	13,290
Peru	12,386	5,629	10,475	379	4,784	87,142	26,490	41	3,533	53,125	3,603	14,109	114,455	2,802	23,117	4,406	11,734	74,407	194,679
Uruguay	17,582	31,887	4,654	2,067	24,568	105,792	17,618	.....	9	59,733	12,566	34,923	9,943	.....	17,205	82	13,875	4,245	81,365
Venezuela	29,515	1,139	19,323	3,406	2,230	34,236	7,840	116	399	31,750	4,023	1,350	17,722	90	5,789	3,528	16,606	5,401	54,261
Aden	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	181	.....	.....	.....	.....	.....	.....	.....	280
China	31,125	2,458	109,973	115,976	8,124	97,494	8,832	271	894	27,437	8,386	35,676	141,595	1,662	51,565	.....	91,355	39,847	163,528
French China	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	169
Japanese China	.....	.....	15,909	.....	272	.....	582	.....	.....	.....	423	1,536	34,593	59	440	.....	2,539	.....	111,182
Chosen	193	282	.....	.....	94	141	2	.....	.....	183	184	55	87	.....	116	.....	4	1,328	7,648
British India	52,463	43,167	71,558	295,714	5,029	24,276	13,244	900	885	33,623	64,784	7,969	295,928	12,550	8,565	101	57,146	24,523	195,116
Straits Settlements	943	2,400	5,940	1,825	19	.....	1,720	.....	.....	721	11,177	.....	6,340	.....	1,428	.....	3,240	3,205	23,605

UNITED STATES EXPORTS OF ELECTRICAL MACHINERY AND APPLIANCES BY COUNTRIES DURING THE YEAR ENDED JUNE 30, 1918 (Continued)

Countries	Batteries	Carbons	Dynamos or Generators	Fans	Heating and Cooking Apparatus	Insulated Wire and Cables	Interior Wiring Supplies (Including Fixtures)	Arc Lamps	Carbon-Filament Lamps	Metal-Filament Lamps	Magnetos and Spark Plugs	Meters and Measuring Devices	Motors	Rheostats and Controllers	Switches and Accessories	Telegraph Apparatus	Telephones	Transformers	All Other
Other British East Indies	$342		$324	$6,295		$50,386	$5,080			$620	$4,906	$1,065	$5,395		$163		$580	$699	$ 112
Dutch East Indies	13,442	$11,843	6,974	459	$48					5,388	23,897	569	4,359	$40	17,239	$34,975	6,672	1,655	31,825
French East Indies					748		132			85									214
Portuguese East Indies																			
Hongkong	3,219	891	41,805	57,544	2,975	2,488	1,631	$125	$480	10,761	1,435	3,401	27,162	993	6,393	40,629	379	38,440	33,708
Japan	15,585	124,731	367,103	30,144	8,053	11,584	7,455	485		1,351	26,811	345,328	469,242	10,962	264,347		186,793	150,551	1,296,146
Russia in Asia		4,201								180	27,244		11,618		360				1,826
Siam	7,589		1,500	10,807	4,044	3,787	3,918			60	2,619	3,850	2,931		1,748			9,030	47,941
Australia	229,720	13,609	103,587	11,434	32,683	203,164	24,264	559		98,009	124,012	80,165	339,652	21,394	163,009	3,634	336,607	65,405	422,002
New Zealand	141,378	12,311	5,757	527	19,428	2,514	4,959	111	640	38,997	44,713	37,905	53,796	3,261	165,949	698	29,427	2,376	107,526
Other British Oceania	3,920					43	425	45		12	1,174		768		86	4,208			791
French Oceania	7,281		830	256	473	614	445		15	1,316	381	1,802	3,930		615	160	194	1,003	6,557
German Oceania	4,490		498	201	10	72	66		20	312	307	6,479	270	53	31				3,726
Philippine Islands	31,031	3,252	8,837	17,479	2,457	95,407	16,229		118	30,219	19,942		52,824	1,365	21,099	6,043	14,963	10,967	104,506
Belgian Kongo																			800
British West Africa	82	25				352	20			25	1,798	90	214				982	285	4,781
British South Africa	149,881	3,490	8,071	6,728	7,133	51,948	3,397		1,185	73,335	52,877	21,164	133,451	8,544	16,722		2,571	49,758	161,337
British East Africa					11	447				2,409	40	143	44		119				767
Canary Islands											172		976						132
French Africa				301							75		2,290						338
Madagascar						246				42	81		816		109		7,751		87
Portuguese Africa			64	15	71	420	24				7		1,200						15,566
Egypt		1,960				70	874				30								50
Total	$3,351,838	$1,525,128	$2,688,169	$818,338	$533,988	$5,730,766	$1,532,309	$13,308	$144,761	$3,182,516	$3,167,325	$1,592,195	$6,598,664	$212,059	$2,229,023	$294,297	$2,566,929	$2,343,968	$16,021,380

THE WEEK
IN TRADE

THE market shows virtually no change. A spurt, however, is expected in the next few months. The Department of Labor is making strenuous efforts to increase new construction and as far as possible keep labor employed.

Wire was a little softer this week and carbon-lamp discounts increased. Aside from these changes the market was very steady.

Labor disturbances are increasing in number and non-employment is growing in extent.

NEW YORK

A few isolated cases of new building projects are continuing to interest the trade. Of most recent note there is reported a thirty-one-story office building for Wall Street, a twelve-story structure on Seventh Avenue, and a marine insurance building on Beaver Street.

If the proposed four-year prohibition of immigration becomes law, the supply of household help will probably be somewhat curtailed. Acting on this assumption, manufacturers of electrical labor-saving devices for the home are looking forward to increased business.

Reports from various sources indicate good business for this season of the year. The government was in the market this week with four specifications for motor-driven kitchen machinery. There is still some pessimism locally, but for the most part electrical distributers are very optimistic and look forward to greatly increased business in the spring. One of the features of the current market is the amount of remodeling that is being done.

Prices are still steady with but few changes reported. Wire is a little softer and carbon-lamp discounts are increased.

LIGHTING FIXTURES.—With the government restrictions removed from glassware, brass and other lighting fixture materials, their supply is once more ample and back orders are being filled. The molders are back at work and now developments in glassware are being perfected which in a short time will be on the market. Most of the work in hand is of the commercial and industrial type, and although some of it is going into new buildings, a great part is being used for replacing old and inefficient types of lighting and in the remodeling of buildings. No reduction in price of glassware and fixtures is expected in the near future.

IRON CONDUIT.—Small amounts of rigid conduit are continually being used in the remodeling business which is occupying the trade at this time and in the few new buildings which are under way. Until the new building era sets in, however, carload shipments are hardly to be expected, but they are looked for later in the spring.

SCHEDULE MATERIAL.—There has recently been and still is a very considerable and interesting demand for schedule material along the waterfront, in shipyards and in dry docks. This is quite outclassing the quiet though steady run of the trade in remodeling and refitting premises where at this time so many tenants are changing locations.

DRY BATTERIES.—Stocks of the standard dry cell and the small dry batteries are very much better than during the war; still, some large dealers have difficulty in keeping sufficient on hand to satisfy their needs. The uses of all sizes of dry batteries are steadily increasing both in the industrial field and in the household, and a high demand holds despite prevailing high prices.

FLASHLAMPS.—With the release of these from government contract both the manufacturers' and the jobbers' stocks are much improved. Their increased demand in the

industrial field keeps these stocks moving well, especially the long type, both with and without the large reflector.

INSULATING FABRICS.—Owing to a drop in price of linseed and China-wood oils and also in cotton, there is a tendency for oiled insulating fabrics to decline a bit in price. This is not general, however, but due to the decision of some jobbers who are overstocked to clear some of their surplus. Orders in the States are not large but are expected to become so in the next few months. Many inquiries have come to both manufacturers and jobbers for export, and several have turned into large orders.

SMALL MOTORS.—Sales of motors from 1 hp. to 50 hp. have picked up in the last two weeks, according to one large manufacturer. He has good local stocks of alternating-current motors but is rather short on direct-current. Two other large manufacturers report no significant increase in sales and poor local stocks.

CARBON LAMPS.—Effective Feb. 1, on standard packages of carbon lamps the discount has increased from 10 to 25 per cent. and on $500 orders it has increased from 10 and 25 per cent to 40 per cent.

RUBBER-COVERED WIRE.—The base this week averages 26½ cents. Four manufacturers quote on 28 cents, two on 27 cents, one each on 26, 24 and 23 cents, and one on cost. This shows a reduction of approximately ¼ cent over the quotations of last week.

CHICAGO

The industrial situation in Chicago has been somewhat complicated because manufacturers who held government contracts have been slow in filing claims for settlement with the government. Altogether there are 658 ordnance contracts in the Chicago territory. Only seventy-one claims have been filed so far.

Among the manufacturers there is considerable interest in the news that Secretary Lane has asked for an appropriation of $200,000 to be used by the Geological Survey in making an investigation of the power supply for the Boston-Washington industrial region.

An indication of the scope of the work to be carried on by the Sanitary District of Chicago is given by the following figures taken from its annual budget. The estimated grand total of the budget is $15,372,144.79. The estimated appropriation for the engineering department amounted to $9,581,862.86.

Jobbers report that the business of January for 1919 was better than the business for January, 1918. A part of this may be attributed to the fact that January, 1918, contained several heatless Mondays.

There have been no price changes during the week except that copper wire has gone a little lower.

COPPER WIRE.—The range in the prices of copper wire is decreasing and the price is lowering somewhat, the present prices being from 25 cents to 27 cents.

CONDUIT.—Jobbers are still on card 41.

ELECTRIC FANS.—Activity among the Middle Western jobbers in connection with buying fan stock is just beginning. It seems to be accepted that fairly large purchases will be made.

MOTORS.—The demand for motors is considered to be fair, although there is no boom market such as existed a few months ago. There is as yet no sign of a large influx of second-hand motors in this market.

FITTINGS.—Close competition is beginning to be noted in this field, the tendency being toward larger discounts for important buyers.

USED MATERIAL.—It was announced this week that among the construction material which is for sale at Camp Grant, Rockford, there are some electrical goods. Chicago jobbers may purchase a part of these, but some of these wholesalers, knowing the character of materials to be sold at Camp Grant, are not much interested in the proposition, as it appears to them that there can be very little material in stock at Rockford that would be of value to an electrical jobber.

BOSTON

Trade is still marking time to a large extent, waiting for buyers and sellers to get together on prices. Jobbers are gradually completing their stocks, which are in excellent shape as regards most lines. Among the very few shortages reported, metallic flexible conduit is for the moment conspicuous. The scarcity in miniature lamps so often reported in these columns has now practically disappeared. Prices hold remarkably firm, on the whole, but the discount on carbon incandescent lamps was increased Feb. 1. Wire is rather weak at a base around 24 to 26 cents. The volume of trade shows little tendency to increase, though optimism rules in commercial circles. Money is still tight, and a recent two-year borrowing of $500,000 on notes by a large central station in the New England territory was put through only on the basis of 7½ per cent interest. A tendency toward central-station expansion can be seen in slightly more liberal policies regarding line extensions here and there. Electrical contractors are rather quiet except where government or shipyard work occupies them. Wiremen are now plentiful, and returning service men are being reëmployed by many concerns. Collections are fairly good and deliveries excellent in most lines.

CONDUIT.—The demand is moderate, and shipments are coming in fairly well. An insufficient supply of metallic flexible conduit is reported.

MOTORS.—Stocks are in good shape for prompt deliveries up to 50-hp. Beyond this size quotations of sixteen weeks are not uncommon, though odd sizes may be picked up here and there for quicker delivery. As yet the motors released from war plants no longer required have not been cast upon the market in sufficient numbers to weigh it down as to price. Some anxiety is felt, however, as to the future course of motor prices when large stocks of motors are offered *en bloc*, if it comes to that. Trade in motors is rather dull, and so far prices show little downward movement.

WIRE.—The demand is small, government business having shrunk to small proportions. Industrial orders are slow to materialize, notwithstanding the recent falling prices. Some manufacturers are reported to be guaranteeing no further price reductions until April 1. Bare copper wire is quoted around a 24-cent base at Boston, weatherproof at 26 cents base, and rubber-covered wire at 27 cents base. Stocks are fairly good for prompt deliveries.

FANS.—A few orders are being placed, but there is a feeling that recent price advances will be difficult to maintain. A good deal of complaint was heard last year when fan prices moved upward, and many buyers in New England prefer to gamble on cool weather to investing heavily in fans at present quotations.

LAMPS.—The miniature-lamp situation is better than for many months. Stocks of tungsten lamps are in general in good shape. No price changes are in sight at this time. One of the lamp factories is said to have a stock of 1,000,000 lamps now on hand for Ford cars. On Feb. 1 the discount on carbon lamps in standard-package lots was increased from 10 to 25 per cent, and that on quantity orders ($500 or over) was increased from a former basis of 10 and 25 per cent off to 40 per cent off. A limited market still exists for carbon lamps in locations involving extra rough handling.

STORAGE BATTERIES.—Trade in units for automobile service is very good. Stocks of batteries are showing more accumulations in diversified sizes and types. The expected market for batteries for yachting use has not yet materialized, but seems sure to come ere long in view of the new building work anticipated as a result of the taking over of so many private vessels by the government during the war. The industrial truck market is quiet at present, but business looks very promising for road trucks. Manufacturers are getting little new business but are actively filling back orders.

APPLIANCES.—Trade is fairly good for this season. The supply of percolators, chafing dishes, etc., is somewhat below normal.

ATLANTA

Information at hand indicates that trade is off this week when compared with the early part of January. Manufacturers report a general decline in the volume and value of orders, especially from industrial sources. Wholesalers and jobbers are taking care of current requirements, and no large transactions of note are taking place. The same is true of dealers and retailers, who are marking time and looking forward to reductions along the entire electrical line. The manufacturers are receiving orders from central stations that they did not expect at this time. Smaller central stations are making a limited demand for staples. Nearly all socket appliances are moving well for retail stocks. This section is just beginning to realize the potential market that exists for labor-saving devices, and the manufacturers expect a big business year.

The Charleston (S. C.) Consolidated Railway, Gas & Electric Company contemplates an issue of $1,500,000 common stock to cover improvements made in the plant and transmission system.

FANS.—A large central station placed a substantial order this week for alternating-current ceiling fans which will be utilized in replacing direct-current fans. Prompt delivery is promised. The jobbers are anticipating a bigger fan season than last year.

ELECTRIC SIGNS.—Representatives of Eastern manufacturers are again active and report a large number of inquiries. The "lightless nights" dampened enthusiasm in this line for some time and the effect has not quite worn off. Novelties in electric publicity are being presented, however, and interest is growing.

FLASH LAMPS.—There is no apparent lull in these. Manufacturing concerns that were engaged in supplying government needs are now concentrating their attention on normal commercial channels, and increased activity is noted.

LIGHTNING ARRESTERS.—The central stations as a whole are anticipating requirements in advance of early atmospheric disturbances, and orders are being placed accordingly. There appears to be an increased demand for low-voltage units up to 2300 volts.

METERS.—Manufacturers are pleasantly surprised by the steady volume of orders coming in for the residential type. This line is maintained mostly by the call from smaller central stations for lots of five to fifteen at a time.

TRANSFORMERS.—Following the general lull in industrial activity very few transactions of any note are being recorded. There is a steady demand for the distributing type, however, and excellent shipments are being offered. Southeastern stocks have again reached a normal state.

MOTORS.—The call for large motors has about ceased, and little or no activity is noted this week. Factory facilities have improved and shipment promises have been cut materially during the last month. A lively trade is taking place in the smaller capacities up to 10-hp. District stocks are filling up rapidly, and facilities for quick distribution have nearly reached normal. At present there are no indications that prices will fall off.

SEATTLE—PORTLAND

The strike of shipyard workers continues with no definite steps toward settlement. Both sides are marking time, awaiting the general sympathetic strike of all unions in Seattle set for Feb. 6, which, with the exception of one local, every organized union in the city has voted to join. One hundred and ten unions will participate, representing about 75,000 workers, if the plans of the Seattle labor leaders carry. Tacoma unions will walk out the same day.

During the past week electrical sales, both wholesale and retail, were fair in spite of the strike and the fact that there were no sales to the shipyards. Jobbers as a whole report January a fair month despite unsettled conditions and the period of depression which usually prevails during that month. Stocks are in better shape daily. Collections have not been materially affected by strike conditions.

Wholesale trade in Tacoma is fair, retail trade quiet. Sales to shipyards and industrials last week were negligible. Spokane district reports wholesale and retail volumes as good. The volume of business continues about the same. This is partly due to some relatively large rush orders for equipment for steel ships that are being outfitted.

The demand for the smaller sizes of motors and general accessories during January kept up better than was expected. Stocks are reported in good condition in practically all lines. Houses have practically completed invoicing. There is no new business of any importance to report, nor any price changes or fluctuating conditions.

Orders from Washington have been received in Portland recently for suspension of work on all steel ships that cannot be turned out during the first half of 1919. It is expected that about twenty-five ships will be affected, representing a total contract valuation of approximately $38,000,000. Inquiries in Seattle disclose that no contracts for steel vessels have been canceled. Two Seattle yards have been asked to report on the cost involved in the cancellation of a number of orders for 8800-ton carriers. The Emergency Fleet Corporation has caused suspension of all work on construction of twelve ships at the Todd dry dock construction plant in Tacoma.

Seattle's building record for January shows an increase in the number of permits issued compared with January of last year. During the month 1713 permits were issued for new construction. Eleven permits were for factories and warehouses of considerable importance.

SAN FRANCISCO

The threatened strike of the ship workers in San Francisco Bay yards has been called off by an overwhelming vote. A considerable and varied amount of new building has been reported during the past month, of which the following are indicative:

New court houses at Quincy, Cal., and Phoenix, Ariz.; a large dairy plant at Manteca, a tractor plant at Bakersfield, new hotels at Taft and Bakersfield, the latter being a half-million-dollar investment; new packing plants at Hanford and Whittier, with several new school buildings at Los Angeles, and an especially large number of garages from all sections of the state.

Credits and collections are reported good. There is an increased disposition on the part of electrical contractors to grant weekly or monthly terms of payment for the larger household appliances.

The Western States Gas & Electric Company and the Coast Valley Gas & Electric Company report important extensions to take care of large plants and mines.

STREET LIGHTS.—The municipalities of Palo Alto, Tracy and Fresno report street-lighting projects, the latter city having actually granted a contract for a system along one avenue for $15,000.

LAMPS.—Considerable activity in the signing of new lamp agents is reported.

MOTORS.—Delivery conditions are far better than they were last year. It looks as though there might be a considerable number of motors for irrigation purposes sold on account of the partial drought threatened in the eastern portion of the central valley because of the small snowfall. This will be overcome to some extent by big irrigation projects planned by local syndicates.

SCHEDULE MATERIAL.—Small wiring devices, such as sockets, switches and rosettes, are in steady though rather small demand. Deliveries are good, but so far the demand in many sections is rather disappointing in its aggregate and reflects plainly the waiting attitude of the general public.

SEWING MACHINES.—Sewing machines are now recognized stock items for electrical dealers in this section. The prices of various styles range from $41.50 on vibrating models to $60 on automatic styles, complete with electric motors. A number of department stores and even some of the sewing-machine stores have had to stock such machines to cope with the demand.

MEDICAL DEVICES.—Many dealers have capitalized on the winter influenza epidemic, for display windows of vibrators, medical batteries and heating pads are to be seen, and San Francisco is practically cleaned out of them.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	10%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	10%

Twin-Conductor

No. 14 Solid	
Less than coil	List
Coil to 1000 ft	10%
No. 12 Solid	
Less than coil	List
Coil to 1000 ft	10%

DISCOUNT—CHICAGO

Single-Conductor

No. 14 Solid	
Less than coil	+20%
Coil to 1000 ft	List
No. 12 Solid	
Less than coil	+20%
Coil to 1000 ft	List

Twin-Conductor

No. 14 Solid	
Less than coil	$115.00
Coil to 1000 ft	100.00
No. 12 Solid	
Less than coil	+20%
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to List
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 36%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
12 to 50	.40	.40— .41
50 to barrel	.35— .36	.36— .37
Barrel lots	.32— .329	.33— .339

BATTERIES DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45	$0.45
12 to 50	.38	.38 to $0.39
50 to barrel	.35 to $0.362	.35 to .372
Barrel lots	.326 to .332	.326 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
3/8	250	$5.00
1/2	250	7.50
3/4	100	10.00
1	50	13.00
1 1/4	50	21.00
1 1/2	50	26.00
2	25–50	35.00
2 1/2	25–50	45.00
3	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
3/8-in. single trip	$75.00	$63.75— 69.75
1/2-in. double strip	75.00— 82.50	72.00— 75.00
1/2-in. single strip	100.00	85.00— 93.00
3/4-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$63.25 to $63.75
1/2-in. double strip	78.25 to $78.75	71.25
1/2-in. single strip	100.00	75.00 to 85.00
3/4-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
3/8	$0.05 1/2	1	$0.25
1/2	.06	1 1/4	.33
3/4	.09	1 1/2	.40
5/8	.12	1 3/4	.47
7/8	.15	2	.55
1	.18	2 1/2	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
3/8-in.—	$25.00–50.70	$24.00–35.20	$23.00–30.25
1/2-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
3/8-in.—	$60.00	$30.00	$26.00–26.50
1/2-in.—	65.00	32.00–32.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
1/4	$0.08 1/2
3/8	.08 1/2
1/2	.08 1/2
3/4	.11 1/2
1	.17
1 1/4	.23
1 1/2	.27 1/2
2	.37 1/2
2 1/2	.58 1/2
3	.76 1/2

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
1/4	$0.05	$0.19
3/8	.06	.19
1/2	.07	.19
3/4	.10	.25
1	.13	.37
1 1/4	.17	.45
1 1/2	.21	.50
2	.28	1.10
2 1/2	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	7% to 7.1%	9% to 9.1%
2500 to 5000 lb.	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 to 1/2 In.	3/4 to 3 In.
Less than 2500 lb.	+5.5% to +3%	+3.5% to +1%
2500 to 5000 lb.	+2.5% to +2%	+5% to +4%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.50 to $7.00
Discount	20% to 25%

CHICAGO

List price	$6.35 to $7.50
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp	100	$0.25
35-amp. to 60-amp	100	.35
65-amp. to 100-amp	50	.90
110-amp. to 200-amp	25	2.00
225-amp. to 400-amp	25	3.60
450-amp. to 600-amp	10	5.50
600-Volt		
3-amp. to 30-amp	100	$0.40
35-amp. to 60-amp	100	.60
65-amp. to 100-amp	50	1.50
110-amp. to 200-amp	25	2.50
225-amp. to 400-amp	25	5.50
450-amp. to 600-amp	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $8.75
1/5 to std. pkg	5.50 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$32.18—$40.77
Coil to 1000 ft.	28.60— 32.98

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.00—$38.00
Coil to 1000 ft.	27.00— 28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$33.00

CHICAGO

Net per 100	$33.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%–32%	10%–27%
$10.00 to $50.00 list	30%–40%	20%–35%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	5%
1/5 to std. pkg.	15%
Std. pkg.	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$20.00 to $21.00
1/5 to std. pkg.	17.00 to 17.85
Standard package, 2200. List per 1000, $21 to $34	

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00–$24.15
1/5 to std. pkg.	17.85– 21.00
Standard package, 2200. List per 1000,	$20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$16.00	$32.00
1/5 to std. pkg.	13.60	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$13.00–$18.40	$32.00–$36.80
1/5 to std. pkg.	11.50– 16.00	27.20– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	List
1/5 std. pkg.	List to 10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-qmp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	+10% to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	List to 8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+25%+15%
$10 to $25 list	+10% to 2%
$25 to $50 list	+5% to 5%
	Low Grade
Less than $10 list	+15% to +5%
$10 to $25 list	+2% to 8%
$25 to $50 list	+5% to 15%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20%
1/5 to std. pkg.	List
Std. pkg.	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+35% to list
1/5 to std. pkg.	+5% to 10%
Std. pkg.	+10% to 18%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 18%	Net
$2.00 to $10.00 list	10% to 28%	5%
$10.00 to $50.00 list	20% to 45%	10%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to $6.50
Discount	20% to 25%

CHICAGO

List price	$6.35 to $7.00
Discount	20% to 30%

WIRE, ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.54–$0.66
No. 18, full spools	.52– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.53 to $0.90
No. 18, full spools	.435 to .64

WIRE, RUBBER-COVERED, N. C

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$17.50–$25.00	$12.00–$17.00	$12.00–$15.00
12	22.20– 27.09	19.98– 23.22	16.65– 23.22
10	30.20– 32.40	27.18– 32.40	21.75– 27.45
8	37.62– 45.72	34.49– 45.72	30.10– 38.10
6	59.58– 72.36	54.62– 60.30	47.66– 57.88

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$20.00–$24.00	$15.00–$17.00	$13.50–$15.00
12	25.83– 30.48	25.83– 30.48	25.83– 26.67
10	35.77– 42.32	35.77– 42.32	30.66– 37.03
8	49.84– 50.36	49.84– 59.36	42.72– 51.94
6	79.80–101.28	68.40– 88.62	68.40– 88.62

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$31.75 to $34.75
25 to 50 lb.	31.75 to 34.75
50 to 100 lb.	30.75 to 33.75

CHICAGO

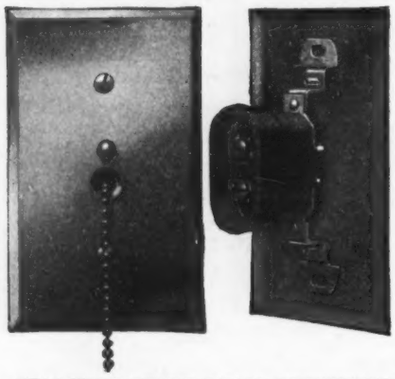
	Per 100 Lb. Net
Less than 25 lb.	$34.76 to $39.75
25 to 50 lb.	33.76 to 38.75
50 to 100 lb.	32.76 to 37.75

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Wall Switch with Pull Chain for Hospital Call Systems

A device called a hospital call switch has just been developed by the Cutler-Hammer Manufacturing Company of Milwaukee. It is made for installation in a standard switch outlet box



REAR VIEW SHOWS SMALL PROPORTIONS AND CONNECTIONS FOR WIRING

and the wiring does not extend beyond the box. No flexible conductors or push-button switches are required for its use, consequently the annoyance of having these parts broken and soiled is eliminated. Furthermore, as the live parts terminate in the wall, it is pointed out that there is no possibility of the patient coming in contact with them. It is claimed, besides, that the installation is much neater and cheaper. The switch consists of a C-H standard push-and-pull mechanism slightly modified, being operated by a pull chain. A linen cord placed within easy reach of the patient is used to pull the switch "on," the cord being attached to a short piece of chain which extends through a horn in the plate and is attached to a projection on a push-button. A push-button placed above the horn extends through a plate and is used by the nurse to push the switch "off." The plate is the same size as those used for wall switches and receptacles, while the switches and plates are made singly or in gangs. The new device may be used on any standard lighting circuit of 125 volts or less.

Slicing Machine with Two-Speed Motor

A new model rotary knife slicer, equipped with a two-speed electric motor, for slicing hard and soft meats is being manufactured by the A. J. Deer Company of Hornell, N. Y., for use in stores and large kitchens. A feature of this machine is a sharpener and smoothing stone for use on the concave side of the rotary knife, which automatically disappears when the opalite meat table is placed in position. The maker states that from two to seventy-five slices per inch may be obtained through the use of this new machine.

Portable Air Compressor with Storage Tank

A new "Electroflater" outfit, consisting of a ½-hp. electric air compressor and a cylindrical pressed-steel reservoir horizontally mounted on three wheels and provided with a handle, has been announced by the Black & Decker Manufacturing Company at Baltimore, Md. The capacity of the compressor is 2 cu.ft. (0.056 cu.m.) of free air per minute, while the reservoir measures 14 in. by 30 in. (35 cm. by

MOTOR, GEAR TRAIN AND COMPRESSOR COMPACTLY PLACED IN ONE HOUSING

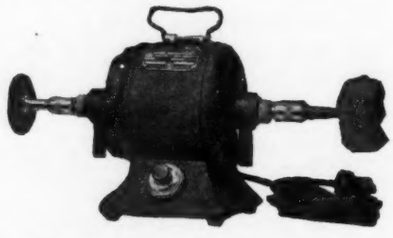
76 cm.) and holds enough air at one filling to inflate five average-size tires from flat to full pressure or ten tires from 40. lb. to 80 lb (18 kg. to 36 kg.). This new outfit is furnished complete with switch, electric cable, attachment plug, pressure gage, safety valve, 25 ft. (63 cm.) of hose, tire connector and all piping and wiring.

A standard Black & Decker No. 2 compressor unit is used in which the motor develops a full 0.5 hp. and operates on alternating current of 60 cycles or less or on direct current. By inclosing the motor, the gear train and the compressor in one housing compactness is secured. Forced circulation of air through this common housing cools the motor and compressor, thus permitting them to be run continuously without overheating. Motor, gears and compressor, including the cylinder walls and piston, are grease-lubricated by capillary attraction. Consumption of energy is said to cost but 0.1 cent per tire.

Portable Motor for Polishing and Grinding

The buffing and grinding motors being made by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., have a wide field of usefulness. They will polish silverware, brassware and glassware through the use of buffing wheels and will grind knives with emery wheels. In factories and shops the burnishing and polishing of small parts can also be done. In addition these motors may be attached to drills, chucks and pulleys for light power work such as driving small lathes and air pumps in shops, in dental and optical laboratories, in jewelers' workrooms and in the home.

The motor is simply constructed, possessing a single speed which is said to result in a greater rigidness and less expensive composition and to eliminate the complications sometimes encountered in multispeed motors. It is silent in operation, has extra long dust-proof bearings, is totally inclosed, and end-play is said to be negligible. A broad and substantial base provides a stable mounting while rubber cushions permit placing the motor, which is portable and has a handle for carrying, on any surface without danger of marring. There are holes in the base for permanent fastening should that be desired. Emery wheels, buffers and pulleys may be attached to both ends of the shaft, which is said to be placed the proper distance from the base to insure convenience in polishing or grinding operations. Nickel bearing caps are furnished to remove the



PULLEY AND DRILLS MAY BE ALSO ATTACHED TO THE SHAFT

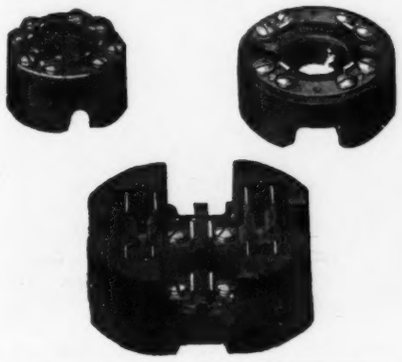
chucks, and the snap switch is conveniently located. These motors, which have a glossy black finish, are supplied with a 10-ft. (300-cm.) cord and a separable plug for connecting to an ordinary lamp socket.

Adjustable Motor Anchorage

Owing to a mistake in the data supplied by the manufacturer, it was erroneously stated on page 202 of the ELECTRICAL WORLD for Jan. 25 that the adjustable anchorages made by the Adjustable Anchorage Company of Detroit, Mich., for lining up motors with machines they drive were suitable for motors of 500 hp. and up. The figure should have been 50 hp. and up.

Connecting Blocks and Cartridge Fuse Base

The Bryant Electric Company of Bridgeport, Conn., has ready for the market two sizes of interconnecting blocks for marine use which are constructed of unbreakable composition and provide means of making connections for branch circuits in junction boxes without the labor and difficulty of using soldered and taped tap-offs. The terminal-plate binding screws are long and heavy and "staked" so that they cannot drop out and be lost. A center hole provides for wire entrance from the back of the box if necessary, and the large groove in the base permits wires to jass through under the block. The dimensions of the smaller size are: Diameter, 1⅝ in. (4 cm.), and height, 1 in. (2.5 cm.). The larger block is 2¼ in.



ABOVE—TWO STYLES OF CONNECTING BLOCKS; BELOW—FUSE BASE

(5.6 cm.) in diameter and 1 in. (2.5 cm.) in maximum height. Brass fastening screws are furnished and kept in place by holding washers. Screw spacings are 1⅜ in. (3.5 cm.) on centers, which is standard on all Bryant marine devices.

The cartridge fuse base, also made of unbreakable composition, provides a means of fusing a circuit in a regular 4-in. (10-cm.) junction box. Binding screws are amply long and "staked" so that they cannot drop out. A hole in the center provides for wire entrance to the back of the box. There is said to be ample room between the fuses for additional circuits to pass through the box. Brass fastening screws are furnished and kept in place by holding washers. Holes for screws are 1⅜ in. (3.5 cm.) on centers, and dimensions of the fuse base are 3¾ in. (9.5 cm.) diameter, 1⅜ in. (3.5 cm.) high. National Electrical Code standard cartridge fuses may be used in this block.

Motored Fan Blowers for Low-Pressure Blast Burners

Fan-motor blowers for delivering a large volume of air at a uniform pressure, which have been designed for use with low-pressure blast burners such as are associated with stereotype, electrotype, confectioners', caldron and soft-metal furnaces, are shortly to be marketed by the Improved Appliance Company of 413 Kent Avenue, Brooklyn, N. Y., in four sizes. They will be chiefly for use in conjunction with blast gas-burning apparatus and will be suitable for installation where the gas burned ranges from 400 cu.ft. to 1500 cu.ft. (12 cu.m. to 42 cu.m.) per hour. These blowers will also be suitable for use in various drying and cooling operations.

The pressure of the air delivered by the new machines will be from 1 ounce to 2 ounces (4.4 g. to 8.8 g.), and the size of the outlets will range from 2 in. to 3 in. (5 cm. to 7.6 cm.). The blowers will be arranged for alternating and direct current at all common voltages and frequencies. Motors of a standard make will be directly connected to the blower proper so that but two bearings need be used. Friction, it is said, is reduced to a minimum, resulting in a large output of air with a low energy consumption. Self-oiling bearings are used and require practically no attention. The blower case is said to be of unique design and is made in two castings to which the electric motor is rigidly bolted. The entire combination is mounted upon an oak panel to facilitate attachment to walls, where the manufacturer recommends placing these blowers, since they will then be more easily kept clean and there will be less possibility of damage. However, where it is desired they may be obtained for floor mounting. The maker says that these new fan-motor blowers offer many advantages over positive pressure blowers, among these being lower initial and operation costs, less floor space requirements and an absence of noise.

Busbar Supports of Unit Type

The busbar support illustrated has been developed by the Delta-Star Electric Company of 2433 Fulton Street, Chicago, and is designed for supporting buses of high ampere capacities. It is said to have an ultimate strength of 6000 lb. against short-circuit forces between buses. With this support the phase conductors are separated into two parallel sets of bars, thereby reducing induction and heating and increasing the carrying capacity per square inch over that secured with the 1¼-in. (3-cm.) spacing which is the usual practice.

INDUCTION AND HEATING ARE REDUCED BY THESE SUPPORTS

Notes on Recent Appliances

Cut-Out and Entrance Switch

A new light-weight double-pole combination entrance switch and cut-out is being made by the Gordon Electric & Manufacturing Company of Waterville, Conn.

Heating Appliance Controller

A thermostat or controller for electric heating pads and other heating devices has been placed on the market by the Electric Appliance Company of Pocatello, Idaho.

Horizontal-Break Oil Switch

An improved design of the Baum "washtub" switch, operating on the horizontal-break principle, is being made by the Pacific Electric Manufacturing Company, 827 Folsom Street, San Francisco.

Small Motor-Generator Sets

A line of motor-generator sets made in fractional-horsepower sizes and rated at 160 watts and from 6 volts to 250 volts is being marketed by the Janette Manufacturing Company, 617 West Jackson Boulevard, Chicago, Ill.

Sewing and Filing Machine

An electrically operated machine which saws, files or laps metal and other light work of this kind has been developed by the Oliver Instrument Company of Adrian, Mich.

Motor-Driven Hammer

A motor-driven hammer for shop use is being manufactured by the United Hammer Company, 141 Milk Street, Boston, Mass., with the electric motor and the controller permanently attached to the machine.

Furnace for Producing Steel from Scrap

An electric furnace adapted to produce high-grade steel for castings and other steel products from steel and iron scraps is being manufactured by the T. W. Price Engineering Company, Woolworth Building, New York City.

Trade Notes

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A man empowered by landowners in Mauritius (No. 28,207) desires to purchase two electric motors of 13 to 14 kw. and 7 to 8 kw., alternating-current, single-phase, 200 volts, 50-cycle, with all their accessories; also 300 ft. of bare wire. Correspondence should be in French. It is requested that testimonials from persons who have acquired the machines be submitted.

A wholesale dealer in France (No. 28,161) wishes to secure a general agency for the sale of electric lighting devices, electric apparatus, electric wires and cables and incandescent lamps. Correspondence may be in English.

A man in France (No. 28,181) wants an agency for small electrical apparatus. Correspondence in French.

An American firm (No. 28,191) with several years' experience in business in China desires to get in communication with manufacturers of waterwheel generating sets (Pelton wheels), with a view of securing the sole agency for the sale of these goods in China. Manufacturers who would be willing to send factory representatives to work in conjunction with the Chinese sales organization are particularly invited to correspond.

Among the products which Sweden particularly needs from the United States, writes Consul General Albert Halstead from Stockholm, is copper wire. Sweden does not need, he states, turbines or electrical machinery.

A report prepared by the bureau of industry of the Greek Ministry of National Economy on the need of mechanical equipment in Greece states that the water-power development cannot be furthered unless a sufficient number of turbines are imported for that purpose. According to the report it is officially stated that steps are soon to be taken to make Greece's lakes and rivers yield 66,000 hp. The larger sources of power are to be worked either by the state or by companies to which grants are to be made. The power obtained is to be used chiefly in the production of high-tension electric energy for the manufacture of nitrogen fertilizer and also for supplying light in certain cities. The report states that to carry out these plans it will be necessary to import large quantities of generators, transformers, transmission systems, and in general all accessory equipment for hydroelectric central stations.

GREAT BRITAIN BARS VACUUM CLEANERS.—Among the items contained in the list of prohibited imports into Great Britain after March 1, except under special license, are vacuum cleaners.

FOREIGN TRADE IN LAMPS.—Figures are available for the November foreign trade in incandescent lamps. The exports for the month ran up to, roughly, $450,000, of which $423,533 was in tungsten lamps. Of this amount, roughly, $78,000 went to Canada, $69,000 to Argentina and $43,000 to Australia and Tasmania. Other countries took less than $40,000 worth. Imports for the month amounted to 27,970 in metal-filament lamps valued at $819, all from Japan.

BRITISH TO INVESTIGATE BRAZILIAN-MACHINERY MARKET.—The British Department of Overseas Trade and the British Engineers' Association, the *Board of Trade Journal* of London states, will shortly investigate the conditions and prospects for the sale of British engineering products in Brazil. The cost of investigation is being defrayed in equal shares by the association and the government. The subjects to be covered by the investigator include importers, shipping methods, Brazilian law, statistics and the chief competitors of British merchants. The investigation will also include the following industries, so far as they are likely to provide openings for engineering plant and machinery: Shipping and shipbuilding, harbor and dock development, hydroelectrical possibilities and public utility development.

CAMPAIGN FOR BETTER PACKING AND MARKING OF EXPRESS SHIPMENTS.—A nation-wide campaign to put an end to the waste attributed to inadequate packing, wrapping and marking of express shipments has been inaugurated by the American Railway Express Company, which is handling the express business on all the railroads of the country. It is expected that by remedying this evil it will be possible to bring about a marked improvement of the express service throughout the country. A "better service campaign" is to start on Feb. 10. No new packing or marking rules have been adopted for the campaign, but express drivers and receiving clerks in the larger cities, as well as express agents in the smaller points, have been instructed hereafter to request that the rules already in force be more carefully observed. The better-packing, better-marking drive is designed to be of as much interest and value to the shipper as to the carrier, for it is a matter of dollars and cents to both. By removing the causes which are responsible for many shipments being lost or damaged in transit it is hoped that a great reduction in the number of express claims filed will be accomplished. Claims are an incubus to the transportation business and bring much dissatisfaction to the shipper, the consignee and the carrier, with no gain to any of them.

FOREIGN TRADE CONVENTION IN APRIL.—The Sixth National Foreign Trade Convention will be held in Chicago on April 24, 25 and 26. It is expected that the first session of the convention will discuss broadly the need of maintaining foreign trade from the point of view of increased industrial productive capacity and of increased capacity for investment both abroad and at home, dealing with the importance of maintaining full and adequately paid employment of labor and also handling the subject from the point of view of our national fiscal policy. One general session will be devoted wholly to the subject of the American merchant marine, with discussion of American shipbuilding, of the operation of ships from the point of view of the provision of cargo, the establishment of trade routes and organization of concentration centers abroad for return cargoes; the operation of the American navigation system in comparison with the navigation systems of other maritime nations, and finally including a discussion of American national maritime policy. Another general session will be devoted to the broad consideration of general foreign trade problems. Intensive consideration of the means and methods that may best be employed to insure the imperative expansion of foreign trade will be considered and there will probably be a group session devoted to advertising for foreign trade and especially to the foreign advertising mediums and the methods of their use. There will also be group sessions dealing with the work and problems of the foreign trade merchant and with direct selling methods for exporting manufacturers.

ENGLISH MANUFACTURERS CONSOLIDATE.—A consolidation by which the facilities of Dick, Kerr & Company, Ltd., for the manufacture of electrical apparatus will be greatly extended has just been announced from London. This is through the organization of the English Electric Company, Ltd., with an authorized capital stock of $25,000,000 to acquire the controlling interests in the Coventry Ordnance Works, Ltd., the Phoenix Dynamo Manufacturing Company, Ltd., and Dick, Kerr & Company, Ltd. Of the constituent companies the Coventry Ordnance Works have shops at Coventry suitable for the construction of electrical machinery and accessories, with subsidiary works at Scotstoun on the Clyde. The main works of Dick, Kerr & Company are at Preston, with subsidiary works at Kilmarnock, Scotland. At Preston the works are especially equipped for the production of steam turbines and the heavier classes of electrical machinery with car works and lamp works adjoining, while the Kilmarnock works specialize on light railway material. The Phoenix Dynamo Works are at Bradford and are laid out for the production of smaller classes of electrical machinery, ranging from stationary motors of 500 hp. to the smallest type used for fans and loom driving. The Williams & Robinson works are at Rugby and equipped for the production of steam turbines, Diesel engines and similar equipment. The several properties have a total area of over 172 acres and an area of floor space of nearly 3,000,000 sq ft. Recent announcements to stockholders say: "Your directors believe that the future success of electrical companies will depend upon their capacity to undertake and carry out large schemes such as the electrification of railways, the construction of large central power stations and the development of hydroelectric installations," and "this amalgamation of interests constitutes a complete organization capable of undertaking comprehensive contracts of the greatest magnitude." The managing director of the new organization is Sir Charles Ellis.

THE SQUARE D COMPANY, Detroit, manufacturer of switches, recently opened a new office at 149 Broadway, New York City. J. A. Jaques, district sales manager, who has been placed in charge of the office, was formerly connected with the Pittsburgh office of the company. At one time he was a member of the sales organization of the Western Electric Company. Mr. Jaques will represent Square D interests throughout the metropolitan district.

THE BLACK & DECKER MANUFACTURING COMPANY, Baltimore, Md., maker of portable electric drills and electric air compressors, announces that D. G. Caywood, formerly sales manager of the Brunner Manufacturing Company, Utica, N. Y., has become special representative to carry on the field work in the distribution of the Black & Decker specialized products. Mr. Caywood was among the first to see the wide possibilities of the electric air compressor and has been actively engaged in this

D. G. CAYWOOD

field for the last fifteen years. Graham W. Brogan, advertising manager of the Duesenberg Motors Corporation, has also joined the Black & Decker organization to handle its publicity. Both Mr. Caywood and Mr. Brogan will have their headquarters at the Baltimore factory.

THE ELECTRIC FURNACE COMPANY of Alliance, Ohio, has closed a contract with the Standard Roller Bearing Company, Philadelphia, Pa., for a 190-kw. continuous, automatic heat-treating equipment. The set consists of one 150-kw. electric furnace for hardening and one 40-kw. electrically heated oil-drawing bath. In addition to this an oil-quench bath is to be installed between the furnace and the electrically heated oil-drawing bath. The material which is to be treated in these furnaces consists of alloy steel balls and ball races.

L. S. DEVOS has recently been appointed general manager of the machinery department, American Machinery Syndicate, New York, N. Y., an association of manufacturers for export trade. From October, 1917, to the latter part of December, 1918, Mr. Devos was chief of the inspection department of the United States Air Service, with offices in Paris, France, during which time he came in touch with the factories and dealers of the mechanical field in France and Switzerland. Previous to his entry into the army Mr. Devos was the New York representative of the Selson Engineering Company, Ltd. The syndicate, it is understood, is about to open an electrical department.

THE TERMINAL MARKET BATTERY COMPANY, 761-763 Central Avenue, Los Angeles, Cal., headed by Roderick N. Harvey, has been organized to manufacture batteries.

THE GENERAL ELECTRIC COMPANY is reported as having purchased at a forced sale the Higbee Glass Company, Bridgeville, Pa., for $90,000.

THE BRYAN-MARSH ELECTRIC WORKS has nearly completed improvements to its plant, at Central Falls, R. I., costing around $60,000.

THE LITTLE ROCK (ARK.) BATTERY COMPANY, it is understood, will increase its capital, and install addtional equipment for battery manufacture.

HERBERT W. GLEDHILL has been promoted from sales engineer to district manager of the Philadelphia office of the Shepard Crane & Hoist Company.

IRA J. FRANCIS, who has been the manager of John A. Roebling's Sons Company, of California, since the middle of 1917, has been elected president of the company to succeed the late Mr. Mooney.

THE DOMESTIC ENGINEERING COMPANY, Dayton, Ohio, is reported as having acquired part of the plant of the Dayton Metal Products Company, which will be used for the manufacture of foreign-lighting outfits.

E. A. BULLIS has returned to San Francisco to resume his former connection with the Federal Sign System (Electric). For the past year he has been in charge of "Dim-A-Lite" sales for the Wirt Company of Philadelphia.

F. S. MILLS, Pacific Coast representative of the National X-Ray Reflector Company, has added Oregon and Washington to his territory. His headquarters are now at San Francisco, where he expects very soon to establish a laboratory.

THE BUSCH-SULZER BROTHERS-DIESEL ENGINE COMPANY, St. Louis, announces that the end of the war enables it to resume work on its stationary Diesel engines and light-weight and commercial marine Diesel engines, which was suspended for several years to devote the entire facilities of the plant to Diesel propelling engines for United States submarines.

THE ELECTRICAL MANUFACTURING COMPANY, Cleveland, Ohio, has purchased from the receivers of the Richard Auto Manufacturing Company nearly five acres of land, with two manufacturing buildings, at the foot of East Seventy-ninth Street, near Broadway and Harvard Avenue, which will be used for its own manufacturing plant. F. T. Kover is the president of the Electrical Manufacturing Company.

H. W. JEANNIN, electrical engineer, announces that he has opened a factory at 110 Eleventh Street, Toledo, Ohio, for the purpose of manufacturing a complete line of single-phase alternating-current motors of the repulsion type. In this new line the rotor will have two windings, one a high-resistance starting winding and the other a low-resistance running winding, the operation being automatic upon closing the line switch.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., has made a number of additions to its line of safety-service, externally operated knife switches. The additions include single-throw and double-throw no-fuse switches in 250, 500 and 600 volts; double-throw fusible switches, 400-amp. to 600-amp. switches in various poles, "Straight Thru" motor-starting switches with under-voltage release coil, and motor-reversing switches.

THE GENERAL ELECTRIC COMPANY has issued to customers the following notice regarding the transfer of accounts from Schenectady to New York: "Beginning Feb. 1, 1919, all records of accounts of customers served by our New York office and its local offices at Buffalo, N. Y., Elmira, N. Y., Erie, Pa., Hartford, Conn., New Haven, Conn., Niagara Falls, N. Y., Rochester, N. Y., Schenectady, N. Y., and Syracuse, N. Y. (formerly kept at Schenectady), will be centralized at the New York office, Equitable Building, 120 Broadway, New York City. All bills for such customers will be rendered from 120 Broadway, New York City. Effective immediately, all payments of bills and open accounts should be sent to the General Electric Company, Equitable Building, 120 Broadway, New York City and all correspondence regarding claims, bills or statements of accounts, etc., should be addressed to the district auditor at that office. This change is for accounting and collection purposes only, and does not apply to inquiries for prices, orders, shipments, etc. Correspondence relating to these should be addressed as heretofore to the nearest sales office. This change affects domestic business only, not foreign business."

THE ROME WIRE COMPANY, Rome, N. Y., writes that it proposes to push the sale of heater cord harder than ever before. The cord is on the approved list of the Underwriters' Laboratories.

THOMAS AND BETTS COMPANY, 63 Vesey Street, New York City, selling agents for The Thomas & Betts Company, is placing on the market a new line of cut-out boxes, split elbows, couplings and T's; pipe straps, watertight connectors and offset fixture studs. The United States Shipping Board, it is reported, purchased large quantities of the watertight connectors.

Trade Publications

PLUG.—A leaflet descriptive of the "T. & W." universal plug has been issued by H. A. Hibbard of Denver, its general sales agent.

FANS.—A booklet descriptive of its "Hurricane" fans has been prepared by the Eck Dynamo & Motor Company, Belleville, N. J.

LAMP GUARDS.—Harvey Hubbell, Inc., of Bridgeport, Conn., is distributing a new circular devoted to Hubbell lamp guards of different styles.

FANS.—Two booklets about its desk, ceiling and ventilating fans have been distributed by the Dayton Fan & Motor Company of Dayton, Ohio.

FANS.—A leaflet having for its subject the fans made by the Fidelity Electric Company of Lancaster, Pa., has been issued by that company.

PULL-SOCKET ATTACHMENTS.—A folder on the Hubbell attachment for pull sockets has been prepared by Harvey Hubbell, Inc., Bridgeport, Conn.

SUPPLY-PART BULLETIN.—The General Electric Company of Schenectady, N. Y., is distributing an index to the various supply-part bulletins it has issued.

LOOM FASTENER.—A leaflet that is descriptive of the K-B loom fastener has been issued by the K-B Manufacturing Company of 287 Second Street, San Francisco, Cal., which makes this device.

FITTINGS.—In a new folder prepared by the Efficiency Electric Company, East Palestine, Ohio, an adjustable insulator support, two types of conduit hangers and a bus cable fitting are described and illustrated.

BELTED DIRECT-CURRENT GENERATORS.—In bulletin No. 40,021 the General Electric Company, Schenectady, N. Y., has given descriptions, illustrations and dimensions of its type LF belted direct-current generators.

WIRING DEVICES.—The M. B. Austin Company, 700 West Jackson Boulevard, Chicago, has distributed a folder that sets forth the savings in material and labor made possible by the use of "Wiremold" and "Wiremold" fittings.

FANS.—Describing its various models of electric fans, domestic catalog No. 1124 of thirty-six pages has been prepared by the Robbins & Myers Company of Springfield, Ohio. A special export catalog No. 1125 may also be procured.

INDIRECT LIGHTING FOR OFFICES.—The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has prepared an interesting booklet which illustrates and sets forth the advantages of the "X-Ray" indirect-lighting system for offices.

FANS.—The Emerson Electric Manufacturing Company of St. Louis, Mo., has issued bulletin No. 4008, which catalogs the Emerson line of fans for 1919 and replaces bulletin No. 4005. The company has also prepared bulletin No. 4009, which supersedes bulletin No. 4006 and is about the Northwind electric fans.

ENGINE-DRIVEN CONTINUOUS-CURRENT GENERATORS, COMMUTATING-POLE TYPE.—Form LD, 125-volt and 250-volt, two-wire, and form LoS, 125-volt and 250-volt, three-wire, commutating-pole engine-type generators manufactured by the General Electric Company of Schenectady, N. Y., have been made the subject of a recently issued bulletin, No. 40,020.

FUSES.—"Keep the Wheels Turning" is the subject of a circular being distributed by the Multiple Fuse Company of 450 Fourth Avenue, New York City. The Atlas four-in-one multiple fuse is featured in this circular, which indicates the important place occupied by fuses in industrial plants.

HIGH-TENSION OUTDOOR SUBSTATIONS.—Bulletin No. 47,706, of fifty pages in loose-leaf form, has been issued by the General Electric Company of Schenectady, N. Y. The subject is weatherproof high-tension outdoor substations. Switching, protective and transformer equipment as well as much other apparatus for outdoor substations are dealt with in this well-illustrated bulletin.

DRAWING TABLES.—The Economy Drawing Table & Manufacturing Company of Adrian, Mich., is distributing its catalog No. 17, in which tables especially fitted for engineers, contractors, architects and others are shown and described. Filing cases and cabinets adapted to receive blueprints also receive attention in this thirty-two-page booklet, which is accompanied by a price list effective Jan. 15, 1919.

STEAM-TURBINE HISTORY.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has issued circular 1591, which is called "A Historical Review of Steam Progress." Written by Francis Hodgkinson, who has a broad engineering and commercial knowledge of steam turbines, this booklet is intended to be a handbook on steam-turbine progress. The history of turbine engineering is gone into, early machines installed in America are illustrated, and from 1899 to 1917 each year's developments and improvements are recorded. The publication is illustrated with views of the different types of impulse and reaction turbines, and the construction of blading, valve chamber, governor, throttle valve, coupling and oil cooler is shown in detail.

New Incorporations

THE LOWNDESVILLE (S. C.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $5,000 by M. P. McCalla, J. W. McCalla, D. L. Barnes, R. T. Broadwell and others.

THE PHENIX LIGHTING FIXTURE COMPANY of New York, N. Y., has been incorporated with a capital stock of $5,000 by M. F. Schechter, M. Friedman and R. J. Wittstein, 916 Stebbins Street, Bronx.

THE WESTRICK COMPANY of Ridgewood, N. J., has been incorporated by J. S. Rue, M. V. Rice and M. G. Zimmerman, all of Ridgewood. The company is capitalized at $15,000 and proposes to deal in electrical goods.

THE BATTERY SERVICE CORPORATION has been incorporated under the laws of the State of Delaware with a capital stock of $100,000. The incorporators are M. M. Lucey, J. H. Weaver and G. S. Didcison of Wilmington, Del.

THE P. M. DREYFUSS COMPANY of New York, N. Y., has been incorporated with a capital stock of $10,000 to deal in electrical supplies. The incorporators are M. E. Sobel, F. J. and P. M. Dreyfuss, 150 Chambers Street, New York City.

THE ELECTRIC VAPOR HEATER COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $100,000. The incorporators are C. L. Rimlinger, M. M. Clancy and P. B. Drew of Wilmington, Del.

THE CHICAGO TELEPHONE SUPPLY COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $150,000. The incorporators are C. L. Rimlinger, M. M. Clancy and P. B. Drew of Wilmington, Del.

THE PAGE MANUFACTURING COMPANY of New York, N. Y., has been chartered by L. Goldburg, S. Schnabolk and J. Stoitch, 158 Madison Street. The company is capitalized at $6,000 and proposes to deal in electrical goods and hardware specialties.

THE CAPE MAY COURT HOUSE (N. J.) LIGHT & WATER COMPANY has been incorporated with a capital stock of $50,000 to distribute and sell water. The incorporators are James H. Birch, Jr., of Burlington; Mary E. Boyd of Philadelphia Pa., and Frank Maris of Lansdowne, Pa.

New England States

AUGUSTA, ME.—Application has been made to the State Legislature for an appropriation for construction of power house and other purposes at the Maine School for Feeble-Minded.

DANA, MASS.—The Town Council has awarded a contract to the Gardner (Mass.) Electric Light Company to furnish elecricity for operating the municipal lighting system for a period of five years.

NORTHBORO, MASS.—The Marlboro (Mass.) Electric Light Company is installing two transformers in the Whittaker Bacon Mill to supply electricity for the different buildings of the company.

PROVIDENCE, R. I.—Plans have been prepared by the Revere Rubber Company for the erection of a power plant, 50 ft. by 90 ft., at its works at Valley and Hemlock Streets.

BRISTOL, CONN.—The Bristol & Plainville Tramway Company expects to purchase from 300 to 500 meters (General Electric Company) and 15,000 incandescent lamps, General Electric and Westinghouse Companies' make. G. E. Cockings is manager.

WATERBURY, CONN.—The Connecticut Light & Power Company has petitioned the State Legislature for permission to divert the waters of the Housatonic River at Ten-Mile River and at Bull's Bridge, and also for authority to build a dam at Little York instead of Southville, and for construction of power houses and conduits.

Middle Atlantic States

BATH, N. Y.—The board of directors of the new State Soldiers' and Sailors' Home has petitioned the State Legislature for an appropriation of $24,000 for installation of an electric system, including an alternating-current generator, engine, switchboard, voltage regulator, etc., and $89,200 for heating system, consisting of four boilers, underground heating line, hot-water plant and underground connections.

BINGHAMTON, N. Y.—Application has been made to the State Hospital Commission of Albany to the State Legislature for an appropriation of $15,000 for laundry equipment and $30,000 for an ash-conveyor for the Binghamton State Hospital.

BROOKLYN, N. Y.—Contract has been awarded by the Navy Department, Washington, D. C., for the construction of the proposed extensions to power plant "A" at the local navy yard to the Franco-American Construction Company, 150 Nassau Street, New York City.

BUFFALO, N. Y.—Bids will be received by W. W. Wotherspoon, superintendent of public works, Capitol, Albany, until Feb. 18, under terminal contract No. 107, for installing electric wiring, lighting, power and battery charging equipment for the canal terminal at Erie Basin, Buffalo. Plans may be seen and other information obtained at the office of the superintendent of public works at Albany, at the office of the assistant superintendent of public works for the Middle Division at Syracuse, at the office of the assistant superintendent of public works for the Western Division at Rochester, and at the canal office, Spaulding's Exchange, Buffalo.

COHOES, N. Y.—Contract has been awarded by the city of Cohoes to the Alpha Electric Company, 124 Hudson Street, Albany, for the installation of a new pumping unit in the city pumping station on North Mohawk Street, at $5,652.

MALONE, N. Y.—Bids will be received by Capt. John A. Coffey, secretary of State Board of Armory Commissioners, 158 State Street, Albany, N. Y., until Feb. 14, for construction of addition to State Armory, including heating, sanitary and electric work. Drawings and specifications may be consulted at the above office, at the New York office of the Department of Architecture, 1715 Tribune Building, and at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is state architect.

NEW YORK, N. Y.—Plans have been prepared by Lloyd I. Phyfe, 670 Anderson Avenue, for the erection of an addition, 25 ft. by 39 ft. at the works of the De Forest Radio & Telephone & Telegraph Company.

ROCHESTER, N. Y.—The State Hospital Commission has petitioned the State Legislature for an appropriation of $70,000 to build an addition to power plant at the Rochester State Hospital; also for buildings, one for housing 250 patients to cost $250,000; one for 200 patients, $160,000; 100 patients, $120,000, and for twelve cottages, $70,000.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ANNANDALE, N. J.—Preparations are being made by the Borough Council for the installation of a new electric street lighting system. Energy for operating the system, it is understood, will be secured from the Hunterdon Electric Light & Power Company of High Bridge.

JERSEY CITY, N. J.—In the annual budget for 1919 an appropriation of $226,500 has been requisitioned by the Board of Freeholders for the maintenance, operation, etc., of the county power plant.

KEYPORT, N. J.—The Monmouth Lighting Company is building an addition to its boiler plant, in which it is proposed to install a 556-hp. boiler with auxiliary equipment.

NEWARK, N. J.—Bids, it is understood, will be received by the Board of Education about April 1 for construction of school building at Sussex Avenue and First Street, consisting of laboratories, power plant, etc., to cost about $500,000. J. H. and W. C. Ely, Fireman's Building, are architects.

ALTOONA, PA.—Notice has been filed with the Public Service Commission by the Penn Central Light & Power Company of an issue of $70,000 in bonds. A portion of the proceeds, it is understood, will be used for extensions and improvements.

CHESTER, PA.—Alterations and improvements will be made to the local exchange building of the Bell Telephone Company, to cost about $10,000.

HAWLEY, PA.—Plans are under consideration for the erection of a hydroelectric power plant at the Welwood Silk Mills, work on which, it is understood, will begin early in the spring. W. F. Suydam is manager.

HONESDALE, PA.—Arrangements, it is understood, are being made by the Honesdale Consolidated Heat, Light & Power Company for the erection of a new power plant, to cost about $50,000, to replace the plant recently destroyed by fire.

PHILADELPHIA, PA. — Arrangements are being made by the Department of Transit for the completion of the Frankford elevated railway system between Callowhill and Arch Streets, at which point a connection will be made with the Market Street subway system. The cost is estimated at $3,500,000.

PHILADELPHIA, PA.—Plans have been completed by the Susquehanna Collieries Company for equipping its anthracite operations in the Mount Carmel and Shamokin coal field for electrical operation. It is proposed to erect one central plant, to cost about $2,000,000, at Green Ridge, near the Pennsylvania Colliery, with high-tension transmission lines to the Richards, Pennsylvania, Scott, Hickory Ridge, Luke Fidler and Cameron collieries. All steam-driven machinery now used in slopes, planes and breakers will be replaced with electrically operated equipment and the steam plants closed down. Wires will also be strung in the mines for underground operations, including drilling equipment, electric locomotives and lighting.

STEELTON, PA.—The Bethlehem Steel Company, it is understood, will utilize the buildings formerly employed as its No. 2 forge shops, recently closed down, for the electrical department at its works, including warehouse and other buildings.

WILKES-BARRE, PA.—The No. 5 coal breaker at the properties of the Delaware & Hudson Company at Larksville, near Wilkes-Barre, was recently destroyed by fire. The loss, including machinery and equipment, is estimated at $300,000.

WILKES-BARRE, PA. — Improvements involving an expenditure of $300,000 are contemplated by the Wilkes-Barre Company, which will include the installation of new generating equipment. Additional boilers, stacks and condensing equipment are necessary at the North River Street station. A new steam-heating line from Northampton to Ross Street on Franklin street is also planned. It is also proposed to enlarge the gas plant on Water Street.

GEORGETOWN, D. C.—Contract has been awarded by the Fussell Young Ice Cream Company, Twelfth and V Streets, Washington, for the construction of a new power plant at Wisconsin and W Streets, Georgetown, to cost about $25,000, to Frank L. Wagner, 1413 P Street, N. W., Washington, D. C.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., as follows: Puget Sound, Wash., until March 11, under Schedule 3724—for 28 annunciators. Until Feb. 10, f.o.b., Schedule 7735½—one motor-driven miller. Until Feb. 14, South Charleston, W. Va., Schedule 7749½—one basket for accumulator. Norfolk, Va., Schedule 7751½—three switchboards complete with spare parts. Until Feb. 11, Brooklyn, N. Y., Schedule 7755½—25,000 ft. of silicon bronze wire. Applications for proposal blanks should designate the schedule desired by number.

WASHINGTON, D. C.—The erection of an electrical shop at the local ordnance works is under consideration by the Ordnance Department.

North Central States

BATTLE CREEK, MICH.—The United Steel & Wire Company is planning to double the output of its plant and will erect several new buildings, including an additional building 100 by 200 ft.; dipping plant, 30 ft. by 40 ft.; extension to warehouse, 40 ft. by 100 ft., and a shipping shed, 20 ft. by 80 ft.

LANSING, MICH.—Bonds to the amount of $25,000 have been authorized for the municipal lighting system.

ST. JOSEPH, MICH.—Plans are under consideration by the Auto Specialties Manufacturing Company for the erection of a new machine shop, 80 ft. by 400 ft., one story.

LORAIN, OHIO.—The Utilities Construction Company is reported to have petitioned for permission to issue $1,250,000 in bonds, the proceeds to be used for construction of power plant.

CLEVELAND, OHIO—Two factory buildings and a five-acre site formerly occupied by the plant of the Richard Auto Manufacturing Company have been purchased by the Electrical Manufacturing Company.

CLEVELAND, OHIO—The Glass Coating Company, which recently awarded contract for a new factory, is in the market for three electric traveling cranes. The company is also placing orders for bending rolls and other plate-working machinery.

MAXWELL, IND.—A company has been organized for the purpose of installing an electric system in Maxwell and erecting transmission lines to Greenburg to secure electricity from the municipal electric plant there to operate the proposed local system.

WAUKEGAN, ILL.—Plans nearing completion for the proposed plant of the H. W. Johns-Manville Company of New York, N. Y., and Milwaukee, Wis., to be erected in Waukegan, will involve an expenditure of about $3,000,000. The plant will supplant the works on the outskirts of Milwaukee, which are to be abandoned. Charles R. Manville of Milwaukee is vice-president and general manager of the Milwaukee works.

GREEN BAY, WIS.—Plans are being prepared by the Conradson Machine Tool Company for the erection of its proposed new turret lathe and machine-tool appliance plant in the spring, for which a site of 12 acres has been acquired in Green Bay. A machine shop, experimental shop, drafting room, office and warehouse and shipping building are included in the proposed plans. C. A. Conradson is chief engineer and manager.

JANESVILLE, WIS.—At a special joint meeting of the Common Council, the Board of Education and the Janesville Chamber of Commerce it was voted to erect a new high school building, with manual training and domestic science departments, at a cost not to exceed $500,000.

LA CROSSE, WIS.—The Ennison Ice Cream Company, 118 Main Street, is contemplating the construction of a factory and warehouse, to cost about $20,000. The plant will be equipped with electrically driven machinery throughout.

SHEBOYGAN, WIS.—The Northern Furniture Company has engaged W. C. Weeks, architect, to prepare plans for a six-story addition, 50 ft. by 145 ft., to its plant at South Water and North Jersey Streets. Much new woodworking machinery and two electric elevators will be installed.

HAWLEY, MINN.—The construction of a new power plant at the school in District No. 4, to cost about $15,000, is under consideration by the board of education.

CLINTON, IOWA.—The City Council has entered into a new contract with the Clinton Gas & Electric Company under which the company is to replace the old arc

lamps now in use, of which there are 211, with type C lamps, and to install 20 additional, which with the 72 now in use will make a total of 303 lamps. The company will also furnish an all-night service throughout the city to supplant the moonlight schedule. The cost of making the change is estimated at from $6,000 to $8,000, and the purchase of the lamps $3,200 additional. Thomas Crawford is general manager.

INDEPENDENCE, MO.—A loan of $50,000 has been voted by the citizens of Independence to the Kansas City (Mo.) Railways Company for the extension of the Independence line from its north terminus at Liberty Street to Sugar Creek.

MACON, MO.—At an election held Jan. 28 the proposal to issue $45,000 in bonds for the installation of a 450-kva. generating unit with condenser equipment at the municipal electric plant was carried. Frank L. Wilcox, Syndicate Trust Building, St. Louis, Mo., is engineer. W. H. Martin is city clerk.

ST. LOUIS, MO.—The Southwestern Bell Telephone Company, Fourth and Locust Streets, and the Kinloch Telephone Company, Tenth and Locust Streets, it is reported, will soon ask for bids for removing 4 miles of overhead telephone and telegraph wires and placing same underground. The cost is estimated at about $100,000.

SIKESTON, MO.—The City Council contemplates calling an election in April to vote on the proposal to issue bonds for the construction of a municipal electric light plant.

COLUMBIA, S. D.—Bonds to the amount of $15,000 have been authorized for the installation of a municipal electric light plant in Columbia.

PLAINVIEW, NEB.—The City Council has decided to engage an engineer to make investigations and prepare an estimate of the cost of enlarging the municipal electric light plant and installing a heating plant, using exhaust steam, for heating the business section of the town, including public school buildings, hospital and public library.

WYMORE, NEB.—The City Council has entered into a contract with the Nebraska Gas & Electric Company to furnish electricity for a period of five years.

Southern States

CHARLOTTE, N. C.—The Southern Power Company of Charlotte, it is reported, is planning another large power development on the Catawba River. According to reports two large dams and power plant will be erected, one at Rhodhiss and the other at Horseford Shoals, 2 miles below Rhodhiss, both in Caldwell County.

ROUGEMONT, N. C.—W. A. Carver is contemplating a water-power development and would like to receive prices on a 50-hp. or 60-hp. generator, also on motors from 1 hp. to 25 hp. and on wire and insulators for 2 miles of electric transmission line.

SUMTER, S. C.—The City Council is considering establishing a municipal electric plant or making arrangements with the Hydro-Electric Company for a new lighting system. Bonds to the amount of $350,000 have been voted for the project.

MIAMI, FLA.—The Miami Ocean View Company contemplates improvements to Star Island, including electric lighting, etc.

MIAMI, FLA.—Contracts will soon be awarded for the construction of a refrigerating plant and storage building on Sixth Street and Avenue B for Armour & Company, Chicago, Ill., to cost about $100,000. J. J. Hamilton, 208 South La Salle Street, Chicago, Ill., is chief architect for the company.

BENTON, ARK.—Arrangements have been made to take over the local electric light plant to be operated in connection with the waterworks plant. It is proposed to purchase a 125-kw. generator and engine to be installed at water plant and to make extensions and repairs to the distribution system. G. A. Smith is superintendent of waterworks.

AUGUSTA, ARK.—The city has recently purchased a 50-kva. General Electric generator directly connected to a Sturdevant engine, with switchboard equipment for same, for the municipal electric light plant.

KNOXVILLE, TENN.—Plans are being prepared by Miller, Fullenwider & Dowling, 6 Michigan Avenue, Chicago, Ill., for the erection of buildings for the University of Tennessee, to include administration buildings; basement finished for mechanical equipment; armory and gymnasium, to cost about $150,000; also erection of agricultural building on the University farm, near Knoxville, to cost about $250,000. The total cost of the buildings is estimated at about $750,000. About $250,000 will be expended to establish and equip an agricultural station in middle Tennessee.

CEMENT, OKLA.—The City Council is considering calling an election to vote on the proposal to issue $50,000 in bonds for electric lighting, waterworks and sewers.

SULPHUR, OKLA.—The plant of the Sulphur Ice, Light & Power Company, it is reported, was recently destroyed by fire.

TULSA, OKLA.—The Sand Springs Railway Company of Tulsa is planning to erect a new station building in Tulsa during the coming year.

DALLAS, TEX.—The Tenth Regiment of Infantry of Texas National Guard is considering the erection of an armory. The building will be 200 ft. by 300 ft. and will cost about $200,000 M. O. C. Hull is captain.

DALLAS, TEX.—The Dallas Railway Company has been granted extension of time to Dec. 1, 1918, by the City Commission in which to begin the construction of its street-railway system and other improvements to cost about $1,200,000.

DALLAS, TEX.—The Southern Traction Company, it is reported, will take steps scon to carry out its deferred project of extending its interurban electric railway from Waco south to San Antonio, via Austin, a distance of about 185 miles. The plan includes the construction of an electric power station at Austin.

HIGHBANK, TEX.—The R. C. Peacock estate, it is reported, will construct a building to replace structure containing store, lighting plant and warehouse, which was damaged by fire, causing a loss of about $35,000.

GOLIAD, TEX.—The local electric light plant of the Goliad Supply Company was recently destroyed by fire.

RANGER, TEX.—Negotiations have been completed by the Southwestern Telegraph & Telephone Company for the purchase of the local telephone exchange and system. Extensive improvements it is understood, will be made to the system.

Pacific and Mountain States

BAKERSFIELD, CAL.—Surveys are being made by the Southern California Edison Company of Los Angeles for a hydroelectric power plant in the Kern River Valley, to cost about $10,000,000. W. Dennis of Los Angeles is chief engineer.

MODESTO, CAL.—Plans and estimates of cost on the Don Pedro dam project have been submitted to the board of directors of the Modesto and Turlock irrigation districts by A. J. Wiley, consulting engineer of Boise, Idaho. The plans include the construction of a concrete arch dam 279 ft. high, 177 ft. wide at base and 16 ft. wide at top, 4 miles above the La Grande dam, to cost $2,787,000; railway from Rosasaco to dam, 8 miles long, $93,000; construction of hydroelectric plant to develop 12,000 kw., below dam, $609,000. The Modesto Irrigation District contemplates an issue of $1,000,000 in bonds, and the Turlock Irrigation District one of $2,000,000.

SAN JOSE, CAL.—The Salsini Packing Company is considering the installation of a complete new unit at its packing plant to double the present output. The cost is estimated at about $100,000 and will include machinery, equipment, electric motors, etc.

SUPERIOR, ARIZ.—A company has been organized, to be known as the Superior Electric Power Company, to construct and operate an electric plant in Superior. The company is capitalized at $100,000. James O'Connell of Superior is president.

GREAT FALLS, MONT.—Bonds to the amount of $250,000 have been voted by the state for the erection of a grain elevator in Great Falls.

DENVER, COL.—Bids will soon be received by the city of Denver for the erection of a garage and warehouse for the Department of Parks at Larimer and Thirteenth Streets, to cost between $700,000 and $800,000. J. B. Hunter is city engineer.

JULESBURG, COL.—Bids will be received by the city of Julesburg until Feb. 26 for construction of a municipal light and power plant, to include power house, one 250-kva. generator directly connected to steam engine, two 250-hp. water-tube boilers, auxiliary steam equipment, concrete or brick chimney, pole-line material, centrifugal pump, etc. Plans and specifications may be obtained from the Henningson Engineering Company of Omaha, Neb., upon deposit of $10. G. S. Kinsman is city clerk.

Canada

EDMONTON, ALTA.—Extensions to the local telephone system, to cost about $262,000, are under consideration. J. E. Lowry is superintendent of telephones.

EDMONTON, ALTA.—Bids will be received by A. G. MacKay, Minister of Municipal Affairs, Parliament Buildings, Edmonton, until Feb. 24 for the construction of administration building service, building, infirmary, three pavilions, power house and tunnels, near Keith Station, Alta. Plans and specifications can be seen and form of tender obtained at the office of the Minister of Municipal Affairs, Parliament Buildings, Edmonton, and the office of the Department of Soldiers' Civil Re-establishment, Engineering Branch, Beveridge Building, Calgary.

MARYVILLE, N. B.—The Nashwaak Pulp & Paper Company is contemplating the construction of a large dam on the Nashwaak River to supply power to operate its new mill.

MONCTON, N. B.—The New Brunswick Water Power Commission is planning to install a record station on the Sevogle River.

NEWCASTLE, N. B.—The construction of a hydroelectric plant to serve the town of Newcastle is under consideration. The cost is estimated at $150,000.

ANTIGONISHE, N. S.—Plans are under consideration by the Town Council for rebuilding the electric light plant, at a cost of about $40,000.

HALIFAX, N. S.—Contract has been awarded by the Department of Public Works, Ottawa, for a power house and laundry for the military hospital at Camp Hill to Rhodes, Curry Company, Ltd., of Amherst, at $210,565.

FORT ERIE, ONT.—Announcement has been made by Sir Adam Beck of the Ontario Hydro-Electric Commission that work will be begun within the next few months on the hydro-radial electric railway to connect Fort Erie with Niagara Falls and Port Colborne. Another project that will be undertaken soon by the Dominion government is the construction of an electric railway between Fort Erie and Hamilton.

LONDON, ONT.—The London Street Railway Company expects to purchase 2 miles of No. 00 trolley wire during 1919.

NIAGARA FALLS, ONT.—The installation of an electrically driven pump for fire protection is under consideration by the Board of Water Commissioners.

PETERBORO, ONT.—The City Council is considering asking the Ontario Hydro-Electric Commission to make further extensions to the street-railway system.

GRAVELBOURG, SASK.—The installation of an electric light plant, to cost about $50,000, in Gravelbourg, is under consideration. S. Chevrier is reported interested.

ROCANVILLE, SASK.—The Town Council is considering the installation of an electric lighting system.

SASKATOON, SASK.—The city Council is considering extensions to the municipal electric street-railway system.

SASKATOON, SASK.—Improvements are contemplated to the municipal electric light plant, to cost about $25,000.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Feb. 19, under Circular 1255, for wire and cable, monotype metal, pumps, steel tapes, conduits, electrical switches, cable grips, etc. Further information may be obtained at the above office.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Feb. 15, for steel, cable wire, brass tubing, sheet lead, copper wire, ammeters, annunciators, batteries, bells, conduit and fittings, cut-outs, lamp guards, insulators, reflectors, slate, rubber tape, voltmeters, etc. Blanks and further information relating to this circular (1253) may be obtained at the above office or at the offices of the assistant purchasing agents, 24 State Street, New York City; 606 Common Street, New Orleans, La., and Fort Mason, San Francisco, Cal.

TAYABAS, P. I.—The Tayabas Light & Power Company, recently organized, has increased its capital stock to $150,000. Of this amount there is $100,000 for sale, to be utilized for the construction of a new hydroelectric power plant, which will supply electricity to seven towns, aggregating about 140,000 inhabitants.

(Issued Nov. 26, 1918)

1,286,040. CONTROL SYSTEM; Walter O. Lum, Wilkinsburg, Pa. App. filed Oct. 6, 1915. To prevent automatically electric railway vehicle motors from attaining a dangerously high speed.

(Issued Dec. 24, 1918)

1,288,460. LIGHTNING ARRESTER; Frank W. Adsti, Chicago, Ill. App. filed Dec. 4, 1916. Means provided for having the gap in the arrester of considerable length.

1,288,474. ELECTRICAL BRUSH CONNECTION AND METHOD OF MAKING THE SAME; Oliver E. Becker, Oak Park, Ill. App. filed April 13, 1918. The leads or pigtails to brushes are made of interwoven or interlaced wires.

1,288,500. SELECTIVE TIME-LIMIT CONTROLLING DEVICE FOR ELECTRIC SWITCHES; George A. Burnham, Saugus, Mass. App. filed July 28, 1911. A prolonged period is required for the operating means to operate the switch.

1,288,501. SELECTIVE TIME-LIMIT CONTROLLING DEVICE FOR ELECTRIC SWITCHES; George A. Burnham, Saugus, Mass. App. filed July 21, 1911. Requires a prolonged period to operate the switch, depending on the value of the overload.

1,288,502. SELECTIVE TIME-LIMIT CONTROLLING DEVICE FOR ELECTRIC SWITCHES; George A. Burnham, Saugus, Mass. App. filed July 21, 1911. Modification of No. 1,288,501.

1,288,503. ELECTRIC MOTOR; George A. Burnham, Saugus, Mass. App. filed Jan. 3, 1913. For connecting a driven member with a driving member and for driving them when connection is made and permitting disconnection immediately upon cessation of the flow of current.

1,288,506. ELECTRIC HEATER; Samuel M. Carmean and James H. Carmean, Kansas City, Mo. App. filed Dec. 8, 1917. The colder air may be taken up, circulated over or discharged through a heating element to raise quickly the temperature of the room.

1,288,507. ELECTRIC HEATING SYSTEM; Samuel M. Carmean and James H. Carmean, Kansas City, Mo. App. filed March 5, 1918. Electrically controlled heating elements heat air as it is delivered from conduits into the rooms of building.

1,288,511. REELING DEVICE FOR ELECTRICAL CONDUCTORS; Albert E. Clarke, Fairport, N. Y. App. filed May 10, 1918. For obtaining a length of cord to correspond with the needs of the user.

1,288,535. ANNUNCIATOR; Vernon Durbin Brookline, Mass. App. filed June 14, 1918. Construction is simplified to reduce cost of production.

1,288,589. ELECTRICAL WELDING MECHANISM; Ralph O. Hood, Danvers, Mass. App. filed June 1, 1917. A certain definite or predetermined amount of electrical energy is supplied for the welding operation and the circuit disconnected thereafter.

1,288,626. TIME-LIMIT RELAY; David L. Lindquist and David C. Larson, Yonkers, N. Y. App. filed July 7, 1914. Is particularly adapted to protect automatically an electric motor or other apparatus from damage caused by a long-continued overload on an abnormally heavy current.

1,288,658. SWITCHING MECHANISM; Luis Nueda, Madrid, Spain. App. filed July 11, 1917. For coupling an organ or harmonium to a piano so that the former instrument will readily respond to the touch of the piano keys.

1,288,709. DUPLEX BALANCING CIRCUITS; Thomas Shaw, Hackensack, N. J. App. filed May 29, 1918. For transmission circuits in which repeaters are employed for the purpose of amplifying telephonic or other signaling currents transmitted.

1,288,722. BATTERY ELECTRODE; Walter O. Snelling, Pittsburgh, Pa. App. filed April 24, 1915. The activity of battery depolarizing materials is increased by the addition of catalytic agents to the usual electrode compositions in galvanic cells.

1,288,724. ELECTRIC SAFETY FUSE; Walter O. Snelling, Pittsburgh, Pa. App. filed March 22, 1915. Means furnished for surrounding the fuse at the instant of fusion with an inert atmosphere in which combustion cannot occur.

1,288,738. ELECTROMAGNETICALLY CONTROLLED SWITCH; Nathan H. Suren, Needham, Mass. App. filed July 22, 1910. Has a strong actuating spring adapted to be released easily so that it may be responsive to a very light current yet it is not liable to be released by a jar.

Record of Electrical Patents

Notes on United States Patents

1,288,739. INCLOSED SWITCH; Alexander K. Sutherland, New Britain, Conn. App. filed Feb. 1, 1918. Combined in a single relatively simple mechanism are means for locking the cover of the switch casing and also for locking the switch in the open-circuit position.

1,288,740. INCLOSED SWITCH; Alexander K. Sutherland, New Britain, Conn. App. filed March 29, 1918. Automatic locking means provided for keeping the cover closed when the switch is closed and for locking the switch open when the cover is open.

1,288,741. INCLOSED SWITCH; Alexander K. Sutherland, New Britain, Conn. App. filed March 29, 1918. Means furnished for automatically locking the switch in an intermediate neutral position when the switch casing is open and for automatically locking the switch casing when the switch is shifted in either direction to close the circiuts controlled thereby.

1,288,742. QUICK-BREAK SWITCH; Alexander K. Sutherland, New Britain, Conn. App. filed March 29, 1918. Means provided for securing a quick break in switches of the double-throw type.

1,288,743. TELEPHONE TRANSMITTER; Naho Tannaka, New York, N. Y. App. filed Nov. 3, 1916. Of the granular carbon type in which the vibratory part is yieldingly supported.

1,288,747. TRAFFIC SIGNAL LAMP; William O. Thiem and George E. Kremer, Minneapolis, Minn. App. filed March 17, 1914. Driver can indicate whether he intends to continue straight ahead, turn to the right or left, or stop.

1,288,750. ELECTRICAL TRANSFORMER; Chester H. Thordarson, Chicago, Ill. App. filed July 10, 1915. Certain improvements are more especially adaptable to the core type of transformers, while others are capable of adaptation to other types.

1,288,751. LONG-DISTANCE HIGH-POTENTIAL ELECTRIC POWER SYSTEM; Chester H. Thordarson, Chicago, Ill. App. filed Oct. 18, 1915. Abnormal pressures due to surges or other conditions are automatically balanced.

1,288,774. ELECTRIC WATER HEATER; Ernest C. Webster, Oakland, Cal. App. filed Jan. 23, 1917. Means provided for connecting the conducting wires to the electrodes which will prevent leakage of water around the connections.

1,288,775. ELECTRICAL ETCHING; Joseph H. Weeks, Rutledge, Pa. App. filed April 1, 1916. The cathodes are arranged in a novel way to permit an even distribution of the current in all parts of the bath.

1,288,787. ELECTRIC MOTOR SYSTEM; David C. Wright, Wickliffe-on-the-Lake, Ohio. App. filed March 27, 1916. Invention pertains to systems containing dynamic braking circuits.

1,288,790. TELEPHONE ATTACHMENT; William Zimmerman, Detroit, Mich. App. filed Dec. 14, 1917. An auxiliary mouthpiece is provided for attachment to the usual telephone mouthpiece.

1,288,820. CUT-OUT SWITCH FOR ALTERNATING-CURRENT MOTOR CIRCUITS; Edward P. Braunwarth, Brooklyn, N. Y. App. filed Dec. 4, 1917. The blades are normally held in closed-circuit position against spring tension by means of a latch which is automatically released by magnetic means when the fuse is blown.

1,288,836. ENGINE-STARTING SYSTEM; William A. Chryst, Dayton, Ohio. App. filed May 25, 1914. An electric motor is used for cranking a gas engine.

1,288,837. TELEPHONE-EXCHANGE SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed Jan. 16, 1915. Improved signaling means provided for systems of the central-energy type.

1,288,855. AUTOMATIC CIRCUIT BREAKER FOR ELECTRIC IRONS; Andrew J. Faber, March 9, 1917. Maintains the iron at a substantially uniform temperature and prevents overheating.

1,288,866. WELDING APPARATUS; Patrick H. Friel, Kenosha, Wis. App. filed Oct. 5, 1916. Welding may be effected while the articles or parts being united are in transit.

1,288,901. SAFETY FIRE-ALARM BOX; John Hutka, Youngstown, Ohio. App. filed April 27, 1918. The arm of a person turning in the alarm will be automatically detained until the arrival of person authorized to unlock the mechanism.

1,288,916. SEAL FOR ELECTRIC APPARATUS; Frederick C. Keyes, East Orange, N. J. App. filed July 7, 1914. For containers of vitreous material.

1,288,922. FLUSH RECEPTACLE; Charles J. Klein, Milwaukee, Wis. App. filed Jan. 18, 1915. Provides an improved closure for the face plates.

1,288,932. ELECTRIC HEATING AND LIGHTING APPARATUS; Richard G. Ledig and Robert C. Ledig, Philadelphia, Pa. App. filed Jan. 18, 1918. May be used for therapeutic purposes, for lighting, for heating food, for drying fruit and other materials.

1,288,935. VIBRATORY CONVERTER; Oscar M. Leich, Genoa, Ill. App. filed Sept. 28, 1915. Can be supplied with alternating current and will change it into unidirectional current and then modify this unidirectional current into an alternating current of different frequency from the impressed alternating current.

1,288,938. ELECTRIC SYSTEM FOR MOTOR VEHICLES; H. Ward Leonard, Bronxville, N. Y. App. filed March 31, 1914. An improved portable light and battery is related to the electrical system and is maintained in a highly efficient condition at all times.

1,288,947. AUTOMATIC LIGHTING SYSTEM; William K. McIver, Elgin, Ill. App. filed April 26, 1916. A brilliant light is produced, regardless of the voltage impressed on the circuit or of the automobile engine speed.

1,288,951. SAFETY FUSE SWITCH; Claude L. Matthews and Walter A. Heinrich, St. Louis, Mo. App. filed April 13, 1917. Replacement of a blown fuse is made safe.

1,288,980. ELECTRICAL ATTACHMENT PLUG; Johann G. Peterson, Jersey City, N. J. App. filed Nov. 23, 1917. Easily connected to an incandescent lamp socket or its equivalent.

1,289,000. ELECTRIC ENGRAVING APPARATUS; Andrew M. Robinson, Providence, R. I. App. filed Jan. 28, 1918. For graduating tools or otherwise marking metal parts.

1,289,014. COMMUTATOR FOR ELECTRIC MOTORS; Edward Strohacker, Freeport, Ill. App. filed May 18, 1917. Invention refers to a disk commutator wherein the brushes contact with the commutator segments at the side face of the commutator.

1,289,020. WELDING CONTROLLER; Edwin B. H. Tower, Jr., Milwaukee, Wis. App. filed July 19, 1915. Will automatically regulate the welding current.

1,289,022. PROCESS AND COMPOSITION FOR ELECTRICAL ETCHING; Joseph H. Weeks, Rutledge, Pa. App. filed July 8, 1916. Novel electrolyte is used.

1,289,030. ELECTRIC GRAVITY BATTERY; David H. Wilson, New York, N. Y. App. filed March 25, 1915. The internal resistance is decreased and a larger output of current with the same weight of zinc and copper is secured.

1,289,036. CONTACT DEVICE; Arthur A. Kent, Rosemont, Pa. App. filed Sept. 23, 1916. For use in making and breaking a primary circuit in an electric sparking system of an internal-combustion engine.

1,289,055. ELECTRIC FURNACE; Lewis G. Rowand, Brooklyn, N. Y. App. filed June 5, 1917. Intended principally for use in the reduction, or partial reduction, of metals from their ores, oxides and like compounds.

1,289,056. ELECTRIC FURNACE; Lewis G. Rowand, Brooklyn, N. Y. App. filed June 5, 1917. Particularly suitable for the reduction of zinc ores and the recovery of spelter therefrom.

1,289,059. ELECTRIC CONTROLLER; Robert W. Stanley, Cleveland, Ohio. App. filed Oct. 7, 1914. Is particularly useful in connection with motor vehicles.